AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

All I Really Need to Know I Learned in Kindergarten? Evidence from the Philippines

Jeffrey R. Bloem, University of Minnesota, bloem023@umn.edu
Bruce Wydick, University of San Francisco

***Selected Paper prepared for presentation at the 2019 Agricultural & Applied Economics Association
Annual Meeting, Atlanta, GA, July 21 – July 23***

Copyright 2019 by Jeffrey R. Bloem and Bruce Wydick. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

All I Really Need to Know I Learned In Kindergarten? Evidence from the Philippines*

Jeffrey R. Bloem[†] and Bruce Wydick[‡]

May 12, 2019

Abstract

Although there is broad agreement that investments in early childhood education are important, questions about the effectiveness of different types of programs persist. We study the effects of two distinct types of kindergarten programs in the Philippines: the Jumpstart kindergarten program, administered by a local faith-based NGO implemented between 2005 and 2017, and a government-sponsored kindergarten program that began to be introduced nation-wide in 2012. Exploiting the timing of the roll-out of these two programs, we find large effects on primary school academic performance due to attending Jumpstart and much smaller effects from attending the government kindergarten. We then examine mediating variables that may explain these differential effects. Although we find strong evidence of positive effects on socio-emotional outcomes such as grit, peer affiliation, self-control, openness, and conscientiousness among children who attended Jumpstart, we find none of these mediating effects among children who attended the government kindergarten. Our results confirm other research that highlights the importance of the development of socio-emotional skills and character formation in the pre-elementary grade levels not only as ends in themselves but as mediators to better academic performance.

Keywords: Early childhood education, socio-emotional skills, cognitive traits, human development, academic motivation, kindergarten

JEL Codes: I21, I24, I25, I28, O22,

*Authors are listed in alphabetical order. Each author contributed equally to this work. The authors thank International Care Ministries (ICM), and in particular David Sutherland, Lincoln Lau, Krisha Lim, Anna Marie Alegre, and Danilo Servano Jr., for help collecting and organizing the data. All errors are our own.

[†]PhD Student, Department of Applied Economics, University of Minnesota, bloem023@umn.edu

[‡]Professor, Department of Economics, University of San Francisco

“All I really need to know I learned in kindergarten. All I really need to know about how to live and what to do and how to be I learned in kindergarten. Wisdom was not at the top of the graduate-school mountain, but there in the sandpile at school.” - Robert Fulghum (1986) *All I Really Need to Know I Learned in Kindergarten*

1 Introduction

Investments in early childhood education matter. These investments often not only lead to higher educational attainment, and in some cases increased learning, but also enable other positive outcomes. Preparing and motivating young children to learn is fundamental for the success of other economic development policies and programs.¹ An extensive empirical literature suggests that interventions in early childhood—in particular through preschool and kindergarten education programs—can have large, positive, and lasting effects across a diverse set of contexts (Currie 2001; Behrman et al. 2004; Cunha et al. 2006; Heckman 2006; Berlinski et al. 2008; Berlinski et al. 2009; Chetty et al. 2011; Rao et al. 2012; Heckman et al. 2013; Gertler et al. 2014; and Araujo et al. 2016). Although these views are shared broadly by policymakers and researchers, several caveats are important to consider.

First, the effectiveness of early childhood education interventions ultimately hinge on the behavioral response of parents (Das et al. 2013, Heckman et al. 2006). For various reasons, parents may either be unwilling to send their children to, or may not value, early childhood education (Bouguen et al. 2018). Moreover, if these beliefs and the parental response to available preschool or kindergarten programs, are positively correlated with lower levels of early childhood investment, then the very children who may need preschool or kindergarten the most may not be enrolled (Blau and Currie 2006; Cornellissen et al. 2016). Second, there is less agreement about the most effective and efficient ways to design interventions to assist disadvantaged youth. Across a variety of countries, early childhood education programs may focus on several different factors of human development, such as: academic skills, nutrition, physical health, mental health, or social and emotional development (Nores and Barnett 2010). Therefore, a critical and persistent question for policymakers is: what types of early childhood education programs are most effective?

In this paper we examine the effectiveness of two distinct kindergarten programs in rural Philippine villages. The first program is the Jumpstart kindergarten program implemented by International Care Ministries (ICM), a faith-based NGO operating in the Philippines. This program aims

¹See a discussion of this idea in the 2018 World Development Report, “Learning to Realize Education’s Promise” (World Bank 2018).

to prepare poor and disadvantaged youth for success in the public education system. The second program is a government-sponsored kindergarten program that was both introduced and legally required across the country based on the Kindergarten Education Act, passed in 2011 by the Philippine government. This legislation mandated that each incoming first grade student must first enroll and participate in at least one year of kindergarten and also expanded access to kindergarten education throughout the Philippines. By exploiting variation in the timing of the rollout of these programs, we compare the effects of enrollment in both types of kindergarten. These two kindergarten programs each use existing Philippines DepEd kindergarten curriculum. The Jumpstart program, however, also included several “enrichments,” such as medical checkups, provided lunch and snack at school, free school supplies, as well as potentially better and more motivated teachers. Comparisons between the government kindergarten program and the Jumpstart program identify the combined effect of these enrichments.²

We find evidence of substantial effects of enrollment in ICM’s Jumpstart kindergarten program on academic performance in elementary school. In particular, we estimate that relative to children who did not go to kindergarten, children who enrolled in ICM’s Jumpstart kindergarten are roughly one and a half to twice as likely to be the top academic performer within their household in both third grade specifically and in all of elementary school in general. By contrast children who enrolled in the government kindergarten program are no more likely to be the top academic performer within their household compared to children who did not go to kindergarten.³

These results motivate an investigation into the factors that potentially mediate the outcomes of both Jumpstart and the government kindergarten program. We find strong evidence of positive effects on socio-emotional outcomes such as grit, peer affiliation, and self-control among children who attended Jumpstart. Re-categorizing our survey questions to create measures of each of the “Big 5” attributes, we find positive effects on openness and conscientiousness among children who attended Jumpstart. Among children who attended the government kindergarten, however, we find weak evidence of any effects on these socio-emotional outcomes. Applying a formal mediation analysis (Preacher and Selig 2012), we find that the effects on our primary outcomes may be mediated by socio-emotional factors, such as self-control and conscientiousness. The direct effect of enrollment in the Jumpstart program, however, remains strong across all specifications.

This paper contributes to the literature on the impacts of early education interventions in

²Section 2 includes additional detail about the specific components of these two kindergarten programs.

³These effects on the government kindergarten program are consistent with the effects of a similar program in Norway that mandated kindergarten enrollment (Drange et al. 2016).

three ways. First, due to the nature of the role-out of ICM’s Jumpstart kindergarten program (beginning in 2005) and the Philippine government kindergarten program (beginning in 2012) we are able to compare the effects of attending these two distinct kindergarten programs. This allows for an important discussion about the relevant counterfactual for children used when estimating program impact. Children from different socio-economic backgrounds may experience different benefits from enrollment in these programs, not only because they possess different characteristics, but also because they would have different early educational experiences in the absence of these programs (Berkes and Bouguen 2018). Our research design allows for not only an estimate of program impact against a “no kindergarten” counterfactual, but also a comparison of impacts between ICM’s Jumpstart kindergarten program and the government kindergarten program.

Second, we aim to investigate the extent to which the development of socio-emotional or psychological characteristics mediates any estimated effects of enrollment in either of the kindergarten programs. A growing literature suggests that the development of socio-emotional or psychological characteristics are instrumental in driving future academic, labor market, and adult life outcomes (Heckman 2008; Borghans et al. 2008; Chetty et al. 2011; Heckman et al. 2013; Wydick et al. 2013; Glewwe et al. 2018). Using measures of grit (Duckworth and Quinn 2009), self-control (Duckworth and Gross 2014), peer affiliation, and positive identity, we aim to understand if any of these characteristics explain not only the treatment effects of each kindergarten program, but also the difference in impact estimates between ICM’s Jumpstart kindergarten program and the government’s kindergarten program.

Finally, results from this research add to the literature comparing the effectiveness of public and private education systems, particularly in developing countries (Andrabi et al. 2008; Tabarrok 2013; Bold et al. 2013; Muralidharan and Sundararaman 2015; Wamalwa and Burns 2018). Our results indicate that children who enrolled in a private kindergarten program—ICM’s Jumpstart program—attained better academic performance in elementary school compared to children who enrolled in a public government-funded kindergarten program. Additionally, school aged children who enrolled in the Jumpstart program are more likely to be currently enrolled compared to school aged children who attended a government kindergarten. Although important considerations relating to external validity and scale-up of a relatively small-scale program implemented by an NGO are important (Bold et al. 2018), for the children in our data, ICM’s Jumpstart kindergarten program was more beneficial than the government kindergarten program in terms of academic performance in elementary school.

The remainder of the paper is structured as follows. The next section introduces and provides some contextual details about both the Jumpstart kindergarten program and the Philippine Kindergarten Education Act. Section three introduces the data, presents the identification strategy we use to estimate effects of enrollment in these two types of kindergarten, and discusses the approach we use to perform mediation analysis. The fourth section discusses the results on both primary outcomes and the mediation analysis. Section five discusses robustness checks and the limitations of this analysis. Finally, section six concludes.

2 Kindergarten in the Philippines

Declining educational standards characterize the first decade of 21st century in the Philippines. Despite a global push for universal primary education, in the Philippines the net enrollment rate for primary schools dropped from 96 percent in 2000 to 84 percent in 2005 (DepEd Philippines 2007). Additionally, in 2005, only 70 percent of students successfully completed primary school (DepEd Philippines 2015). The cost of the reality described by these figures lingers into the future. In 2013, one in every ten—or about 4 million—Filipino youth between the ages of 6 and 24 was not enrolled in school (Philippine Statistics Authority 2013).

As a response to these trends, in 2005, ICM started the Jumpstart kindergarten program to improve the preparation of children for elementary school education. Jumpstart began with four kindergarten centers in 2005, steadily growing to 75 schools. Several years later, in 2011, the Philippine government passed the Kindergarten Education Act (No. 10157) that mandated kindergarten education as an integral part of the country’s basic education system, and the government began to quickly phase-in kindergarten access across the country. In 2013 the government legislated that all public schools provide kindergarten to local students.

2.1 ICM’s Jumpstart Program

The core objectives for Jumpstart are informed by the Millennium Development Goals “Education for All” objective. This guides the aim of the Jumpstart program to improve early childhood education in rural areas of the Philippines, particularly targeting the most disadvantaged and vulnerable children. ICM designed Jumpstart in line with their faith-based values.⁴

⁴The Biblical basis for Jumpstart comes from Jeremiah 29:11 “For I know the plans I have for you,” declares the Lord, “plans to prosper you and not to harm you, plans to give you hope and a future.”

In practice, Jumpstart includes several components. The first is a ten month kindergarten education program that meets five days per week, similar to any other standard kindergarten program. ICM designed this first component specifically to prepare students for future success in public school. In this vein, ICM carefully instructs Jumpstart teachers to use the existing Philippines DepEd kindergarten curriculum. The second component aims to add “enrichments” over and above the typical Philippine public kindergarten program. These enrichments include medical checkups, provided lunch and snack at school, and free school supplies. The medical checkups include provision of de-worming treatment, standard medical screenings, and height and weight monitoring on a monthly basis. The daily provided lunch and snacks include nutritionally fortified rice and other food including soy protein. The provided school supplies include school uniforms and other necessary classroom infrastructure. Finally, the Jumpstart program also includes a component that targets parents. This component is essentially the VHL “Transform” program which exists as ICM’s core program and includes access to credit services, house visits, and livelihood training.⁵

The selection and implementation of Jumpstart follows a strict set of guidelines. An application must be submitted to ICM by a local pastor. This application must provide (a) evidence of support from the village which includes a signed statement of commitment from at least five members of the local church, (b) a village profile providing information about the need for a kindergarten in the area, and (c) a list of at least 40 potentially eligible kindergarten-aged children. Jumpstart teachers must apply with a referral letter from their local pastor indicating their commitment and passion for early childhood development and education. Additionally, they must be a university graduate with a degree in education and must attend a Philippine Department of Education teacher training program. Children must be at least five years old on or before October 31st of the year they begin kindergarten and come from a poor family. In practice, families are recommended by their local pastor and parents must sign a commitment letter with ICM. Class sizes are strictly capped at 40 children, however, a few “visitor” children can observe the class but are generally not entitled to the additional school supplies or other provisions.

Initially, through Jumpstart, ICM provided a service that the Philippine government was not providing. Before passage of the Kindergarten Education Act in 2011, ICM signed an agreement with the Philippine government that the Jumpstart program would only fill the gaps in the public government program. In 2018 ICM officially ended the Jumpstart program based on an under-

⁵See Bryan et al. (2018) for a detailed discussion and evaluation of ICM’s “Transform” VHL Program.

standing that the public K-12 education system was operating at scale throughout the country. At the time, the Jumpstart program had implemented over 700 kindergarten class cohorts and served about 20,000 children.

2.2 The Kindergarten Education Act

In 2011 the Philippine government passed the Kindergarten Education Act which implemented a “mandated and compulsory” pre-elementary year of kindergarten education. After the 2011-2012 school year, all Filipino children were required to spend a year in kindergarten before enrolling in first grade.

The passage of this act lead to positive advances in enrollment in early childhood education. The net enrollment rate in kindergarten jumped from 55 percent in 2010 to 75 percent in 2015 and elementary school completion rates grew from 70 percent in 2005 to 83 percent in 2015 (UNESCO 2015). These changes benefited the poorest Philippine households with children. In 2008, the gross enrollment rate in kindergarten for the poorest 20 percent of the population was 33 percent. In 2013, however, this rate increased to 63 percent (World Bank 2016). Although these figures suggest positive changes in kindergarten and elementary enrollment, the Philippines continues to lag behind neighboring countries in a number of other dimensions. For example, only 53 percent of children from the poorest 20 percent of households attend high school (World Bank 2016). This implies that although disparities in access to early childhood education may have declined, disparities in the quality of early childhood education may still persist.

Although kindergarten enrollment has surged in the Philippines, questions remain over the quality of both Jumpstart and the government kindergarten program relative to both the counterfactual of no kindergarten and to each other. We utilize the age-eligibility rule for kindergarten in both programs in conjunction with the timing of the introduction of the programs to different villages to identify their respective effects on subsequent academic performance as well as potential mediators that may explain differences in their effects.

3 Empirical Framework

3.1 Data

The data come from a household survey administered in 2017.⁶ The questionnaire includes information on kindergarten enrollment, mother characteristics, primary school academic performance, and socio-emotional or psychological characteristics of each child. In total, the data includes 2,692 children in 1,132 households across 93 villages.

In third grade every student in the Philippines takes the National Achievement Test. This test assess student reading ability, in both English and Filipino, mathematics, and science. Based on the results of this test, students are placed into different class sections. About 30 of the best performing students are placed in the top section, then the next 30 students are placed in the following section, and so on. Within each section the students are ranked from best to least based on their performance on the National Achievement Test. Unfortunately we do not have access to the results from the National Achievement test for the children in our data.

Instead, we consider four main outcome variables. The first two are within-household comparisons of academic performance of each child as reported by mothers. We asked mothers which of their children performed best in third grade and elementary school, respectively. The core limitation of these variables is they are not objective or administrative measures of student academic performance. They do, however, identify mother’s perception of who is the best performing child in third grade and elementary school. Although these perceptions in academic performance are subjective, they may be what ultimately determine demand for schooling in the future (Jensen 2010). The third outcome variable indicates whether each child was placed in the top section in third grade.⁷ Finally, the fourth outcome variable indicates if a “school aged” child—between the ages 4 and 24—is currently enrolled in school. These final two main outcome variables provide a more objective measure of educational and academic performance.

The questionnaire also included questions asking mothers about academic and socio-emotional skills that potentially mediate academic performance in primary school.⁸ These questions broadly take the form: “Relative to children his/her age [child i] practices path frequently,” or “Relative to

⁶The survey was designed by a research team at the University of San Francisco and implemented in partnership with ICM.

⁷A limitation of this variable is that only 78% of children have valid responses. We therefore, predict the missing values using a linear regression based on kindergarten enrollment, the within-household indicator of best academic performance in third grade, the child’s age, the sex of the child, birth order dummy variables, and household/mother fixed effects.

⁸Each of these questions are listed in the appendix.

others his/her age [child i] is easily discouraged.” To which mothers answered using a one through five Likkert scale; with one indicating “strongly disagree” and five indicating “strongly agree.” These questions aggregate together to create indices measuring academic or scholastic skills and a host of socio-emotional characteristics such as: grit, peer-affiliation, self-control, self-identity, spirituality, and behavior. We can also use the same survey questions to generate an alternative set of indices, which approximate the “Big 5” personality characteristics. These characteristics include: openness, conscientiousness, extraversion, agreeableness, and neuroticism. This alternative set of index variables allows for a robustness check to the specific categorization of these questions measuring socio-emotional skills. We use the methods of Kling et al. (2007) to generate standardized indices. In the appendix we show a table which summarizes these variables. They each have a mean of zero and a standard deviation of one.

Table 1 shows summary statistics of our data. Mothers in our data are about 44 years old. Less than half have attended high school and only about 10 percent have attended college. Most are married, stay at home, and participated in ICM’s “Transform” VHL program. Children in our data are typically teenagers when we administered our survey. Those who are still attending school are in the latter grades of primary school or junior high school.

By simply comparing means, we can already begin to see the effect of kindergarten enrollment on our main outcome variables. Children who attended Jumpstart are much more likely, than both children who attended government kindergarten and no kindergarten, to be the best performing child in both third grade and elementary school. Children who attended Jumpstart are much more likely, relative to both children who attended government kindergarten and children who did not attend any kindergarten, to be placed in the top section in third grade. Finally, most children who attended either the Jumpstart or government kindergarten are still enrolled in school. This is not the case for children who did not attend kindergarten.

3.2 Identification Strategy

Simply comparing means may lead to biased estimates of the true effect of enrolling in either Jumpstart or the government kindergarten. Children who attend a specific type of kindergarten (e.g., Jumpstart or government) or not may differ based on household characteristics (e.g., access to kindergarten, income level, socio-economic status, etc.) or based on individual characteristics (e.g., age, sex, birth order, etc.). To address these potential issues we use the following empirical approach to estimate the effect of enrollment in each of these two distinct kindergarten programs.

Our first approach is to estimate the following linear regression using OLS:

$$Y_{hi} = \beta_0 + \beta_1 \text{Jumpstart}_{hi} + \beta_2 \text{Government}_{hi} + X'_{hi}\Gamma + \omega_h + \epsilon_{hi} \quad (1)$$

In equation (1) Y_{hi} represents binary variables that represent one of each of our four primary outcome variables. These primary outcome variables include: (a) a variable indicating if a child is the best performing sibling within their household in third grade, (b) a similar variable indicating if the child is the best performing sibling in elementary school, (c) a variable indicating if a child placed in the top third grade section, and finally (d) and variable indicating if a school-aged child is currently enrolled. The *Jumpstart* variable is a binary variable that indicates if the child attended a Jumpstart kindergarten. Similarly, the *Government* variable is a binary variable that indicates if the child attended a government kindergarten program. X is a vector of child-level control variables, such as child age, the sex of the child, and birth order dummy variables. These control variables in particular help to control for any potential reporting or recall bias embedded in our data. Finally, ω_h is a household fixed effect and ϵ_{hi} is the error term. As a robustness test on this specification, we estimate a variant of equation (1) which, instead of household fixed effects, includes village fixed effects with household/mother control variables.⁹

Although we are controlling for household fixed effects, enrollment in Jumpstart or government kindergarten may still be endogenous and thus β_1 and β_2 may be biased estimates of the true effect. In particular, parents may make strategic choices about which of their children to send to a particular type of kindergarten. If, for example, parents tend to send more capable children to the Jumpstart kindergarten program, then the estimate of β_1 from equation (1) will be biased upwards. On the other hand, if parents tend to send less capable children to the Jumpstart kindergarten program, the the estimate will be biased downwards. Since it is difficult to reason the magnitude and direction of the potential bias of results estimated from equation (1), a more sophisticated method is necessary.

We make use of the fact that the Jumpstart kindergarten program started at different times in different villages and that older children are less likely to attend kindergarten upon the program's first implementation. Specifically we use the age of children when jumpstart entered their village to instrument for Jumpstart participation. We use a similar strategy to instrument for enrollment in government kindergarten. Specifically we use the age of children in 2011, when the Philippine

⁹These results are shown in the appendix.

government passed the Kindergarten Education Act, to instrument for enrollment in a government kindergarten. In practice we use a vector of dummy variables that represent if a child is a particular age—zero through 30—when the jumpstart program and government program entered their village. Specifically we implement this instrumental variable method by estimating the following equations:

$$Jumpstart_{hi} = \sum_{j=1}^{30} I_{ji} + \sum_{g=1}^{30} I_{gi} + X'_{hi}\Pi + \tau_h + \mu_{hi} \quad (2)$$

$$Government_{hi} = \sum_{j=1}^{30} I_{ji} + \sum_{g=1}^{30} I_{gi} + X'_{hi}\Psi + \kappa_h + \eta_{hi} \quad (3)$$

$$Y_{hi} = \delta_0 + \delta_1 \hat{Jumpstart}_{hi} + \delta_3 \hat{Government}_{hi} + X'_{hi}\Xi + \rho_h + \nu_{hi} \quad (4)$$

In equations (2) and (3) I_j and I_g each equal one when a child is a particular age between zero and 30 at the time when the Jumpstart program and the government kindergarten program started in their village, respectively. In equation (4) $\hat{Jumpstart}$ and $\hat{Government}$ are the predicted values from equation (2) and (3).

These instruments are both relevant and valid. These instruments are strong since age is a key determinant for kindergarten eligibility, and therefore attendance. Of course, instrument strength can be tested directly by calculating an F-statistic testing for the joint significance of all instruments in predicting attendance in Jumpstart ($F - statistic = 428.28$) and government kindergarten ($F - statistic = 39.20$). Additionally, these instruments are excludable since the timing of the rollout of both the jumpstart and government kindergarten programs are exogenous to parental choices—such as kindergarten enrollment, child-baring decisions, etc. Figure 1 shows that there is sufficient variation in enrollment rates across each age at both Jumpstart and government and kindergarten introduction in a village.

3.3 Mediation Analysis

Although a central motivation for this analysis is to estimate the effects for Filipino children of attending two distinct types of kindergarten, we are also interested in trying to understand what factors mediate the estimated effects on our primary outcomes. In our data we have information on both academic and socio-emotional skills. These are skills that children who attend kindergarten may possess that children who do not attend kindergarten may not possess. Additionally, the Jumpstart program took special care in aiming to instill positive values through the various

“enhancements” to the core Philippine kindergarten curriculum.

To assess the extent to which specific academic or socio-emotional skills mediate the primary results we follow the approach of Preacher and Selig (2012). In general, this approach calls for a two step procedure for estimating the effect of kindergarten enrollment on primary outcomes via potential mediating variables (i.e., the indirect effect) and the effect of kindergarten enrollment on primary outcomes conditional on potential mediating variables (i.e., the direct effect). The first step estimates the following specification:

$$M_{hi} = \alpha_0 + \alpha_1 \textit{Jumpstart}_{hi} + \alpha_2 \textit{Government}_{hi} + X'_{hi} \Theta + \psi_h + \xi_{hi} \quad (5)$$

In equation (5) M_{hi} is an index variable measuring either academic or socio-emotional skills of child i in household h . Similar to equation (1), the *Jumpstart* and *Government* variables are binary variables indicating if the child attended either a Jumpstart or government kindergarten. X is a vector of child-level control variables, such as child age, the sex of the child, and birth order dummy variables. Finally, ψ_h is a household fixed effect and ξ_{hi} is the error term. Similar to the analysis of effects on primary outcomes, we can instrument for participation in Jumpstart and government kindergarten using the age of children when each program first entered their village. The instrumental variable framework essentially mirrors equations (2) through (4), but instead uses the outcome variables, M_{hi} , which represent potential mediating index variables. Again, as a robustness test on this baseline specification, we estimate a variant of equation (5) using village fixed effects with household/mother control variables instead of household fixed effects.¹⁰ The second step estimates and augmented version of equation (1) that includes the potential mediating variables in the specification.

$$Y_{hi} = \gamma_0 + \gamma_1 \textit{Jumpstart}_{hi} + \gamma_2 \textit{Government}_{hi} + M'_{hi} \Lambda + X'_{hi} \Delta + \varphi_h + \zeta_{hi} \quad (6)$$

Equation (6) is identical to equation (1) except for that it includes the vector M_{hi} which indicate various potential mediating variables. In the Preacher and Selig (2012) framework the direct effect of Jumpstart attendance on primary outcomes is equal to γ_1 , the coefficient on *Jumpstart* in equation (6). The indirect effect is equal to the product of α_1 in equation (5) and the corresponding coefficient in the vector Λ in equation (6). A corresponding process follows for the direct and indirect effects on government kindergarten enrollment. We can instrument for participation in

¹⁰These results are shown in the appendix.

Jumpstart and government kindergarten using the age of children when each program first entered their village. Again, the instrumental variable framework essentially mirrors equations (2) through (4), but instead includes the vector M_{hi} as additional covariates in the regression specification.

Although the approach of Preacher and Selig (2012) is relatively straightforward to implement, causal inference is challenging. In particular, controlling for the mediating variable M_{hi} can introduce bias into otherwise unbiased causal effect estimates if the potential mediating variable is endogenous (Acharya et al. 2016). We follow the reasoning of Heckman and Pinto (2015) which states that in order for mediation analysis to have a credible causal interpretation we need to assume independence between kindergarten enrollment (i.e., treatment status) and any of the potential mediators (i.e., measured inputs) with respect to our primary outcomes conditional on other observed covariates. This assumption is often called the sequential ignorability assumption (Imai et al. 2010; 2011). We implement mediation analysis by making this assumption and support it in two ways: First, we implement unobservable selection and coefficient stability tests of Oster (2017) to test if coefficients on mediators change based on the inclusion of observable controls; if they do not, then Oster (2017) argues that coefficient estimates would be unlikely to change with the inclusion of unobservable variables. Second, similar to Heckman et al. (2013), we identify mediators over a theoretically comprehensive measure of personality, in our context the “Big 5” personality traits. Heckman et al (2013) argue that using a comprehensive set of personality mediators greatly reduces the possibility of a confounding personality variable that would introduce bias in OLS estimation.

4 Results

In this section we discuss two sets of results. First, the primary results show how attending either the Jumpstart or government kindergarten program affects education outcomes. As explained in Section 3.1, these primary outcomes include: the mother’s report of which child performed best in third grade and overall in elementary school, whether the child was placed in the highest ranking section in third grade, and whether “school aged” children—broadly defined as those aged 5 to 24—are currently enrolled in school. Second, the mediation results show how impacts of the programs may occur through influences of different personality traits, perhaps affected through participation in the program. Here, in the first-stage we show how attending either the Jumpstart or government kindergarten program affects socio-emotional outcomes. We use two sets of socio-emotional variables. The first is a core set of indices that includes grit, self-control, peer affiliation,

self-identity, behavior, and spirituality. The second is an alternative set of indices that represent the “big 5” personality characteristics: openness, conscientiousness, extraversion, agreeableness, and neuroticism. We also use indices that broadly measure current and future academic skills. In the second-stage we show how much these potential mediating characteristics influence our primary outcome variables. Finally, we discuss both the direct effect and the indirect effect, through measured inputs, of attending each of these kindergarten programs.

4.1 Primary Results

What is the effect of enrollment in the Jumpstart or the government kindergarten program on academic outcomes in primary school? To answer this question, we estimate the household fixed effect regression—shown in equation (1)—and the instrumental variables regressions—shown in equations (2) through (4). We report the results from these regressions in Table 2.

The first two columns show the effect of enrollment in Jumpstart and government kindergarten on performing best in third grade, relative to siblings within the household who did not attend kindergarten. The results are both statistically and economically significant. As reported in Table 1, the probability that a child who did not attend any kindergarten is the best performing sibling in third grade is about 28 percent. The coefficient on our OLS estimate is 0.350 ($p < 0.01$), and the coefficient from our IV estimate is 0.586 ($p < 0.01$). These estimates thus suggest that enrolling in Jumpstart increases the probability of a child being the best performing sibling by between roughly 125 to 200 percent. Additionally, there no evidence of any meaningful effect of enrollment in government kindergarten on the probability that a child is the best performing sibling in third grade. A test of equality of effects between enrollment in Jumpstart and the government kindergarten shows that the difference is very statistically significant.

Results for the effect on performing best in elementary school, shown in columns (3) and (4) are similar. Again as reported in Table 1, the probability that a child who did not attend any kindergarten is the best performing sibling in elementary school is about 30 percent. This means that OLS and IV estimates suggest that enrolling in Jumpstart increases the probability of a child being the best performing sibling by between 84 and 144 percent. Again, there is no evidence of any meaningful effect of enrollment in government kindergarten on the probability that a child is the best performing sibling in elementary. Formal tests of equality of these effects show that the difference is highly statistically significant.

Columns (5) and (6) show the effects of enrollment in Jumpstart and government kinder-

garten on the probability of placing in the top third grade section. In contrast with the previous two outcomes, this outcome is more objective and identifies academic performance based on the government-administered National Achievement Test. Based on the results of this test, students are placed into different class sections. About 30 of the best performing students are placed in the top section, then the next 30 students are placed in the following section, and so on. We find economically and statistically significant effects for both kids who attended Jumpstart and the government kindergarten program, relative to siblings who did not attend any kindergarten. As reported in Table 1, children who did not attend any kindergarten realize a probability of being placed in the top third grade section is about 39 percent. OLS and IV estimates suggest that children who enrolled in Jumpstart are about 50 percent more likely to place in the top section in third grade than their siblings who did not attend kindergarten. Similarly, OLS and IV estimates suggest that children who enrolled in government kindergarten are about 40 percent more likely to place in the top section in third grade than their siblings who did not attend kindergarten. A formal test of equality of these effects suggest that these effects are not statistically different from one another.

Finally, columns (7) and (8) report the effects of enrollment in Jumpstart and government kindergarten on current enrollment status for “school aged” kids. In this setting, “school aged” kids are aged from 4 through 24 years old. This age restriction limits the sample size slightly to 2,482 children. Similar to the results in the first four columns, we find strong evidence of meaningful effects for children who attended Jumpstart and no evidence of meaningful effects for children who attended government kindergarten. As shown in Table 1, only about 56 percent of “school aged” children who did not attend any kindergarten are currently enrolled in school. Therefore, IV estimates suggest that school aged children who enrolled in Jumpstart are about 42 percent more likely to be enrolled in school. Additionally, there no evidence of any meaningful effect of enrollment in government kindergarten on current enrollment status of school aged children. Formal tests of equality of the effects between Jumpstart and government kindergarten indicate the difference is statistically significant.

These results lead to two conclusions about the effects of kindergarten education in the Philippines. First, across three of our four outcomes, we find that the government kindergarten does not perform significantly better than no kindergarten. For both the mother’s report of academic performance among siblings and current enrollment status of school aged kids, only children who enrolled in Jumpstart fair better than kids who did not attend any kindergarten. The government

kindergarten program is effective, however, in increasing the likelihood that a child is placed within the top third grade section. Although we are unsure why the government kindergarten appears to have a significant impact on this measure of academic performance relative to its insignificant impact in the other measures, it may be because placement into the upper class is a relatively blunt indicator of academic performance. It also does not seem to translate into increased levels of future school enrollment. Thus taken together, our results indicate greater impacts from the Jumpstart program, and that the approach and quality of kindergarten seem to matter substantially.

One obvious concern regarding our first two outcomes is the mother’s subjective report of academic performance among siblings. For this outcome, we asked mothers to list their children in order of academic performance in both third grade specifically and in elementary school in general. Although the presence of the National Achievement Test provides parents with some objective information to base their reporting, they may forget their children’s scores or grades. It is reassuring, therefore, that the effect of enrollment in Jumpstart on more objective outcomes—such as placing in the top third grade section and current enrollment status—is also positive, of meaningful magnitude, and statistically significant.

4.2 Mediation Results

We present the results of the mediation analysis in three parts. First, we show and discuss the results from the first-stage regression that estimates the effect of attending Jumpstart or the government kindergarten on each of our potential mediating variables. Second, we show and discuss the results from the second-stage regression that estimates the direct effect of attending Jumpstart or the government kindergarten conditional on a vector of potential mediating variables. Finally, we discuss the estimated direct and indirect effects of this mediation analysis.

4.2.1 Mediation First-Stage

As previously noted, the questions in our survey allow us to create several different sets of indices. The core set of indices include variables measuring the following psychological variables: grit, peer affiliation, self-control, and self-identity. This set of indices also include variables measuring inter-personal behavior, spirituality, academic skills, and scholastic skills. We can also use the same survey questions and group the questions together differently to generate an alternative set of indices. These indices include variables that measure each of the “Big 5” personality characteristics: openness, conscientiousness, extraversion, agreeableness, and neuroticism. More

detailed information about the specific survey questions associated with each index is presented in the appendix.

Table 3 reports results on the psychological attributes from the core set of indices. The first two columns show estimates of attending Jumpstart or government kindergarten on a grit index. Both the OLS and IV estimates suggest relatively large and statistically significant effects on grit. Since the outcome variable is standardized to have a mean of zero and a standard deviation of one, the coefficient estimates suggest that attending Jumpstart increases grit by between 0.16 and 0.22 standard deviations, large enough to have significant effects on task completion (Duckworth and Gross, 2014). Although the effect of attending government kindergarten is smaller and not statistically significant, formal tests fail to reject equality of these two effects. We find similar effects for peer affiliation, self-control, and self-identity. In particular, attending Jumpstart seems to substantially increase these psychological attributes. IV estimates suggest that peer affiliation increases by about 0.28 standard deviations, self-control increases by about 0.21 standard deviations, and self-identity increases by about 0.20 standard deviations. Again, although in each of these psychological attributes there seems to be no effect of government kindergarten, formal tests fail to reject equality of the Jumpstart effect estimate and the government kindergarten effect estimate.

Table 4 shows the estimated effects of attending Jumpstart and the government kindergarten on behavior, spirituality, and two academic skills indexes. The behavior index includes questions about whether the child is obedient to instruction or breaks rules at home and school, whether the child acts like others their age, and whether the child is kind to younger children. The first two columns of Table 4 show that attending either Jumpstart or the government kindergarten does not have any measurable effect on this behavior index. The spirituality index includes questions on whether the child participates in church youth group activities, whether the child asks questions about God, whether the child enjoys attending church, and whether the child gives the family's offering at church. Similar to the results on the behavior index, columns (3) and (4) of Table 4 show that there is no effect on spirituality due to attending either the Jumpstart or the government kindergarten.

The last four columns of Table 4 report results on two different academic indices. The academic expectations index includes questions about the likelihood a child will finish high school, graduate from university, get a good job, and be generally successful in life. The academic skills index includes questions about how much the child—relative to others their age—reads, practices math, takes interest learning new languages, achieves highly in school, and is considered smart. IV estimates

for the effect of both attending Jumpstart and government kindergarten are relatively large and statistically significant. The estimates in column (6) of Table 4 suggest that attending either the Jumpstart or government kindergarten increases the academic expectations index by between 0.17 and 0.24 standard deviations, relative to not attending any kindergarten. The estimates in column (8) suggest that attending either the Jumpstart or government kindergarten increase the academic skills index by about 0.28 standard deviations, again relative to not attending any kindergarten.

These results from our core set of potential mediating variables suggest two intermediate conclusions. First, the results in Table 3 suggest that the Jumpstart program seems to have increased the grit, peer-affiliation, self-control and self-identity of the children who attended, relative to children who did not attend any kindergarten. Although we fail to reject equality of the effect among children who attended Jumpstart and children who attended government kindergarten, we see no evidence that the government kindergarten program influenced these psychological attributes in any way. Second, in Table 4 we see that both the Jumpstart and government kindergarten programs increased indices measuring future academic expectations and current academic skills. This suggests that some kindergarten, regardless if it was the Jumpstart or government kindergarten, has some academic benefits relative to not attending any kindergarten.

We carry out our estimations on an alternative set of indices, where we index responses to our survey questions within the “Big 5” personality traits: openness, conscientiousness, extraversion, agreeableness, and neuroticism. These indices should be viewed as alternatives to the psychological, behavior, and spirituality variables from the core set of indices. We do this for two reasons. First, comparing the results between the core and alternative sets of indices allows for a robustness test of results to different aggregations of the survey questions. If we find similar results across similar types of socio-emotional variables, then this should lend credence to any broad conclusion about the effects of these kindergarten programs. Second, the “Big 5” personality traits have been developed by psychologists to represent broad dimensions of personality, within which more specific traits are nested (Goldberg, 1993). Following Heckman et al. (2013), we use our “Big 5” personality trait index in order to mitigate the possibility of outside personality traits exhibiting an endogenous influence on our potential mediators.

We report results of the effects of attending Jumpstart or the government kindergarten on the “Big 5” attributes in Table 5. The first two columns report the OLS and IV estimates on the openness index. The IV estimate suggest that attending Jumpstart increased openness by about 0.28 standard deviations. Although both OLS and IV estimates do not indicate any effect

among children who attended the government kindergarten, formal tests fail to reject equality of attending Jumpstart and government kindergarten. Columns (3) and (4) report a similar finding on the conscientiousness index. OLS and IV estimates suggest that attending Jumpstart increased conscientiousness by between 0.21 and 0.32 standard deviations. Again, there is no evidence of any meaningful effect for children who attended the government kindergarten. In column (4), however, we can reject equality of Jumpstart and government kindergarten effects at the 10 percent level. The effects reported in columns (5) through (10) in Table 5 all generally show that attending Jumpstart or government kindergarten has at most weak and at least no effects on extraversion, agreeableness, and neuroticism. IV estimates for the effect of attending Jumpstart on extraversion and agreeableness are relatively large and could represent meaningful changes in these attributes but are not statistically significant at conventional levels.

Comparing the results between the core and alternative set of socio-emotional indices suggests at least one conclusion for these first-stage mediation results. According to psychologists who study the components of important psychological attributes, attributes such as self-control and grit are often considered as subsets of conscientiousness (John and Srivastava 1999). Given the results reported in Table 3, it may not be too surprising to see that of the all of the “Big 5” attributes, the strongest effects of attending Jumpstart is in the conscientiousness index.

4.2.2 Mediation Second-Stage

The second-stage of the Preacher and Selig (2012) mediation approach essentially mirrors the main empirical specifications, but includes a vector of indices representing potential mediating factors. In this sub-section we report results separately for the core and alternative sets of indices. Tables reporting results for each of the second-stage mediation regressions are in appendix Tables A7 through A14. In this sub-section these results are summarized in Figures 2 and 3. In each of these figures, the effects on Jumpstart and government kindergarten attendance are the direct effects of participating in either kindergarten program, relative to not attending kindergarten, conditional on all of the measured potential mediating variables. The effect on each of the index variables are the second-stage mediation effect, which needs to be multiplied with the associated first-stage mediation effects in order to calculate the indirect effect. These indirect effects will be discussed specifically in the next sub-section.

Figure 2 shows the second-stage mediation results using the core set in indices for each of our four primary outcome variables. Each panel represents the IV estimates from the second-stage mediation

regression. Panel A shows results for the outcome variable indicating if the child performed best in third grade relative to their siblings. These results indicate a large direct effect due to attending Jumpstart, which persists even conditional on potential mediating index variables. The direct effect on attending government kindergarten remains small and statistically insignificant. With the exception of the spirituality index, the coefficient on each of the index variables is statistically insignificant. Even the effect on the spirituality index remains relatively small. The results are similar for the outcome variable indicating if the child performed best in elementary school relative to their siblings, shown in Panel B. The direct effect of attending Jumpstart remains relatively large, there is no direct effect of attending the government kindergarten, and the effects on each of the index variables are either relatively small or statistically insignificant. The only difference is that in Panel B, the effect on the self-control index is now statistically significant at the conventional level of confidence.

Panel C, in Figure 2, shows the second-stage mediation results for the outcome variable indicating if the child placed in the top section in third grade. The direct effects on both Jumpstart and government kindergarten attendance are relatively large and consistent with the primary results shown in Table 2. This indicates that these direct effects persist despite controlling for all of the potential mediating index variables. Additionally, none of the coefficients on the index variables are statistically significant at conventional levels are all quite small. Finally, Panel D, shows the second-stage mediation results for the outcome variable indicating current enrollment status for school-aged children. Similar to the results in Panels A and B, the direct effect on Jumpstart attendance is large and roughly equivalent to the primary results shown in Table 2. Again, along with the finding that the effect estimates on each of the index variables are small or statistically insignificant, this indicates that the direct effect is strong even conditional on each of the potential mediating variables.

The overall pattern, displayed in Figure 2 shows up again in Figure 3 which reports results using the alternative set of indices. Again, each panel represents the IV estimates from the second-stage mediation regression. Panel A shows results for the outcome variable indicating if the child performed best in third grade relative to their siblings. Similar to Figure 2, these results suggest a large direct effect of attending Jumpstart, no evidence of a direct effect of attending government kindergarten, and small and statistically insignificant effect on each of the index variables. Panel B, which shows results for the outcome indicating if the child performed best in elementary relative to their siblings, also lead to similar findings. Again, the direct effect of attending Jumpstart is large.

The only index variables with statistically significant effects are agreeableness and neuroticism, however similar with the effects on the other index variables, these effects are relatively small.

The second-stage mediation effects, using the alternative set of index variables shown in Panel C, also show similar results to those reported in Figure 2. Again the direct effect of both Jumpstart and government kindergarten are large, statistically significant, and are consistent with the primary results reported in Table 2. Aside from the effect estimate on the openness index, which is small but statistically significant at the conventional level of confidence, we find no effects on the other index variables. Finally, in Panel D, we show the second-stage mediation results on the outcome variable indicating current enrollment status for school-aged children. These results are consistent with those shown in Figure 2, using the core set of index variables. The direct effect of attending Jumpstart remains strong even when conditioning on all index variables. Additionally, all of the effects on the “Big 5” index variables are small and statistically insignificant at the conventional level of confidence.

4.2.3 Direct and Indirect Effects

As we discussed in the previous sub-section, the direct effects of attending each kindergarten program largely persist even when conditioning on potential mediating variables. More specifically, the effects on Jumpstart and government kindergarten attendance shown in Figures 2 and 3 are qualitatively consistent with the primary effects shown in Table 2. This implies that any potential indirect effect—calculated by multiplying the corresponding first-stage and second-stage effects together—are relatively small. Indeed this is largely what we see.

Panel A in Table 6 shows the indirect effect of the core set of indices. This set of potential mediating variables includes: grit, peer affiliation, self-control, self-identity, behavior, and spirituality. In most cases, we find that the 95% confidence interval includes zero which indicates a statistically insignificant indirect effect. The one exception is that we find a statistically significant indirect effect on self-control in column (2) of Table 6. This suggests that self-control may have a small mediating effect on academic performance elementary school.

We find similar results in Panel B in Table 6 with the alternative set of indices. This set of potential mediating variables include the “Big 5” attributes: openness, conscientiousness, extraversion agreeableness, and neuroticism. Again, similar to the results shown in Panel A, we find that in most cases the 95% confidence interval includes zero. There are two exceptions. First, we find evidence of a statistically significant indirect effect of conscientiousness in column (1). This

makes sense given the significance of our self-control effect in the former index as self-control is an important sub-trait of the “Big 5” trait of conscientiousness. This suggests that conscientiousness may have a small mediating effect on academic performance in third grade. Second, we also find evidence of a statistically significant indirect effect of openness in column (3). This suggests that openness may have a small mediating effect on the probability of being placed in the top section in third grade.

What explains these results? Results from the first-stage of the mediation analysis, shown in Tables 3 and 5, show evidence of relatively large effects of attending Jumpstart on socio-emotional attributes such as grit, peer affiliation, self-control, openness, and conscientiousness. Each of these effects suggest that attending jumpstart increases these attributes by between 0.2 and 0.3 standard deviations. When we consider the second-stage of the mediation analysis, however, the effects of these potential mediating index variables have relatively small effects on our primary outcome variables, suggesting large and persistent direct effects of attending the Jumpstart program. This begs the question: What is in the direct effect that makes attending Jumpstart so beneficial even conditional on important socio-emotional attributes that seem to have also improved due to attending Jumpstart?

One plausible explanation is the health components included in the Jumpstart program as enrichments to the standard kindergarten curriculum. These health components included the provision of de-worming treatment, daily provided nutritionally fortified lunch and snacks, and regular medical screening on a monthly basis that monitored each child’s physical growth and development. Each of these individual components—de-worming (Miguel and Kremer 2004), school feeding (Alderman and Bundy 2012; Aurino et al. 2019; Chakraborty and Jayaraman 2019), and medical screening (Glewwe et al. 2001; Alderman et al. 2006; Maluccio et al. 2009)—are known to spur positive effects on educational and academic outcomes. Therefore, it is plausible that these components of the Jumpstart program play an important role in driving the persistent and large direct effects.

Although, this is a plausible explanation we are ultimately unable to identify these effect quantitatively because the provision of these health components is completely co-linear with attending Jumpstart. Therefore, in our present study we are unable to disentangle any of these likely important indirect effects of the health components from the rest of the Jumpstart program. Future work could follow up on this study by investigating the indirect effects of the health components in explaining the overall benefits of the Jumpstart program.

5 Limitations and Robustness Checks

Similar to any empirical study, our results come with limitations. In this section we aim to address these limitations and perform robustness checks whenever it is possible. Our aim is to be forthcoming about any limitations so as to properly establish the credibility of our empirical findings and motivate future research on the topic of the effectiveness of various types of early childhood education programs in the Philippines specifically and developing countries more broadly.

5.1 Outcome Variables

One possible shortcoming of our paper are the measures we use as outcome variables. Like most survey data, our data is elicited from the head of household. With education data, however, it is often ideal to rely at least to some degree on institutional data, to which we did not have access for this study. One weakness with our parental data is that some of our outcomes rely on parental ranking, which does not take into account the size of the differences between siblings. Conceivably there could also be biases that confound behavioral outcomes with academic outcomes, so that if a child behaves better in school as a result of a kindergarten intervention, this could be confused in a parent's mind with better academic outcomes. While institutional data clearly may be advantageous in that it would provide exact measures of scores on grades and national exams, parental data may contain its own advantages. These would include a better ability to see the larger and more holistic picture of academic development among children, the ability to account in academic performance for illnesses and other events outside a particular child's control, and a knowledge of other factors that may allow the parent to adjust for other factors (e.g., the challenge of switching schools from a family move, better or poor teaching quality as reported by children, etc.). As such, asking parents to rank their children in overall academic performance embodies some advantages that may compensate for disadvantages. Additionally, it is worth mentioning again that the core results are robust to more objective measures, such as whether or not the child placed in the top third grade section and current enrollment status for school aged children.

5.2 Village Fixed Effects

We prefer the use of household fixed-effect estimations on our data, especially when used in conjunction with sibling rankings over elementary school academic performance. They control for parenting, many environmental factors common to the household, and to some extent genetic fac-

tors, while simultaneously inducing variation in outcomes through the sibling ranking exercise. However, in Appendix Table A1, we present standard OLS (without fixed effects) and village fixed-effect estimations on the four basic outcomes in our data. These estimations are very similar to our OLS estimations with household fixed-effects, actually showing slightly higher point estimates for most of the primary outcomes. Estimates using standard OLS give somewhat higher point estimates than the household fixed-effect estimates, but point estimates for village fixed-effect estimates are lower and, while still mostly positive, often statistically insignificant. This is not surprising given the selection method used by ICM for the Jumpstart program, where the most disadvantaged children were chosen for the program. Failing to correct for the level of poverty of the household should bias estimates downwards.

5.3 Unobservable Selection

Also in the Appendix, we present robustness checks using Oster (2017) bounds, which calculates a value known as Oster’s δ , representing the ratio of the influence of unobservables to observable control variables that would render a null effect from the variable of concern. A high delta is thus generally considered to represent a result more robust to possible endogeneity. A negative result implies that when observable controls (or fixed effects) are added that the magnitude of the coefficient increases, and if this occurs, the result is unlikely to decrease if one were able to include unobservables in the estimation. As seen in Table A6, Oster’s δ is negative, implying a result that is highly robust to endogeneity. For placement in the top section, coefficients are virtually identical with and without observable controls, yet Oster’s δ is equal to 0.45, implying a less robust result.

6 Discussion and Conclusion

Our research examines the relative impacts of two types of kindergarten programs that were introduced in the Philippines during the last 15 years, a government kindergarten which began to be introduced across the country beginning in 2012 and a faith-based kindergarten, Jumpstart, which was phased in in 2005 and operated in the country until 2017. We find that while the government kindergarten had modest effects overall, the impacts of Jumpstart were much larger. Ordinary least squares estimations with household fixed effects indicate children enrolled in Jumpstart were more than twice as likely to be listed by their mothers as having the highest academic performance in elementary school among all of their siblings, in third grade (when a National Achievement

Test measures child academic performance), more likely to be placed in the highest third-grade section, and more likely to continue be enrolled in school at time of survey. These results are robust to instrumental variable estimation that exploits the timing of the village-level rollout of these kindergarten programs.

We test for mediation, trying to understand through which channels the Jumpstart program affected academic outcomes, finding that the program increased grit, peer affiliation, self-control, and a stronger sense of self-identity along with academic skills, where the government kindergarten only exhibited a significant effect on the latter. Measured in terms of the “Big 5” personality traits, Jumpstart positively affected conscientiousness and openness to new experience. We find modest evidence that the increase in academic achievement caused by Jumpstart was mediated by an increase in Conscientiousness.

We believe that these results re-enforce the conclusions of previous work carried out in the United States (Heckman et al. 2013) for developing countries. This research strongly indicates the development of socio-emotional skills during the pre-school and kindergarten years to be of vital importance to subsequent academic achievement and later-life outcomes. Future work should be carried out in the context of lower- and middle-income countries to provide external validity to these results.

References

- Acharya, A., Blackwell, M., and Sen, M. (2016) "Explaining Causal Findings Without Bias: Detecting and Assessing Direct Effects," *American Political Science Review*, vol. 110, issue 3, pp. 512-529.
- Alderman, H., Hoddinott, J., and Kinsey, B. (2006) "Long term consequences of early childhood malnutrition," *Oxford Economic Paper*, vol. 58, issue 3, pp. 450-474.
- Alderman, H. and Bundy, D. (2012) "School Feeding Programs and Development: Are We Framing the Question Correctly?" *World Bank Research Observer*, vol. 27, no. 2, pp. 204-221.
- Altonji, J. G., Elder, T.E., and Taber, C.R. (2005) "Selection on Observed and Unobserved Variables: Assessing the Effectiveness of Catholic Schools,?" *Journal of Political Economy*, 113(1), pp. 151-184.
- Andrabi, T., Das, J., and Khwaja, A.I. (2008) "A Dime a Day: The Possibilities and Limits of Private Schooling in Pakistan," *Comparative Education Review*, vol. 52, no. 3, pp. 329-355.
- Araujo, M.C., Carneiro, P., Cruz-Aguayo, Y., and Schady, N. (2016) "Teach Quality and Learning Outcomes in Kindergarten," *Quarterly Journal of Economics*, vol. 131, issue 3, pp. 1415-1453.
- Aurino, E., Gelli, A., Adamba, C., Osei-Akoto, I., Alderman, H. (2019) "Food for Thought? Experimental Evidence on the Learning Impacts of a Large-Scale School Feeding Program," *Working Paper*, Presented at the 2019 CSAE Conference.
- Behrman, J.R., Cheng, Y., and Todd, P.E. (2004) "Evaluating Preschool Programs When Length of Exposure to the Program Varies: A Non-parametric Approach," *The Review of Economics and Statistics*, vol. 86, no. 1, pp. 108-231.
- Berkes, J. and Bouguen, A. (2019) "Heterogeneous Preschool Impact and Close Substitutes: Evidence from an Early Childcare Program in Cambodia," *Working Paper—Unpublished manuscript*.
- Berlinski, S., Galiani, S., and Manacorda, M. (2008) "Giving children a better start: Preschool attendance and school-age profiles," *Journal of Public Economics*, vol. 92, (5-6), pp. 1416-1440.
- Berlinski, S., Galiani, S., and Gertler, P. (2009) "The effect of pre-primary education on primary school performance," *Journal of Public Economics*, vol. 93, (1-2), pp. 219-234.
- Blau, D. and Currie, J. (2006) "Preschool, Day Care, and After School Care: Who's Minding the Kids?" in *Handbook of Economics of Education*, volume 2, Hanushek, E. and Welch, F. pp. 1163-1278. Amsterdam: Elsevier.
- Bold, T., Kimenyi, M.S., and Sandefur, J. (2013) "Public and private provision of education in Kenya," *Journal of African Economies*, vol. 22, supplemental issue 2, pp. 39-56.

- Bold, T., Kimenyi, M.S., Mwabu, G., Ng'ang'a, A., and Sandefur, J. **(2018)** "Experimental evidence on scaling up education reforms in Kenya," *Journal of Public Economics*, vol. 168, pp. 1-20.
- Borghans, L., Duckworth, A.L., Heckman, J.J., and ter Weel, B. **(2008)** "The Economics and Psychology of Personality Traits," *Journal of Human Resources*, vol. 43, no. 4, pp. 972-1059.
- Bouguen, A., Filmer, D., Macours, K., Naudeau, S. **(2018)** "Preschool and Parental Response in a Second Best World: Evidence from a School Construction Experiment," *Journal of Human Resources*, vol. 53, no. 2, pp. 474-512.
- Bryan, G.T., Choi, J.J., and Karlan, D. **(2018)** "Randomizing Religion: The Impact of Protestant Evangelism on Economic Outcomes," *NBER Working Paper*, No. 24278.
- Chakraborty, T. and Jayaraman, R. **(2019)** "School feeding and learning achievement: Evidence from India's midday meal program," *Journal of Development Economics*, in press, available online.
- Chetty, R., Friedman, J.N., Hilger, N., Saez, E., Whitmore, D.S., and Yagan, D. **(2011)** "How Does Your Kindergarten Classroom Affect Your Earnings? Evidence from Project Star," *The Quarterly Journal of Economics*, vol. 126, issue 4, pp. 1593-1660.
- Cunha, F., Heckman, J.J., Lochner, L., and Masterov, D.V. **(2006)** "Interpreting the Evidence on Life Cycle Skill Formation," in *Handbook of the Economics of Education*, E. A. Hanushek, F. Welch, (eds.), vol. 1, ch. 12, Elsevier.
- Currie, J. **(2001)** "Early Childhood Education Programs," *Journal of Economic Perspective*, vol. 15, no. 2, pp. 213-238.
- Das, J., Dercon, S., Habyarimana, J., Krishnan, P., Muralidharan, K., and Sundararaman, V. **(2013)** "School Inputs, Household Substitution, and Test Scores," *American Economic Journal: Applied Economics*, vol. 5, no. 2, pp. 29-57.
- Drange, N., Havnes, T., and Sandström, A.M.J. **(2016)** "Kindergarten for all: Long run effects of a universal intervention," *Economics of Education Review*, vol. 53, pp. 164-181.
- Duckworth, A.L. and Quinn, P. D. **(2009)** "Development and Validation of the Short Grit Scale (Grit-S)," *Journal of Personality Assessment*, vol. 91, issue 2, pp. 166-174.
- Duckworth, A.L. and Gross, J.J. **(2014)** "Self-Control and Grit: Related but Separable Determinants of Success," *Current Directions in Psychological Science*, vol. 23, no. 5, pp. 319-325.
- Gertler, P., Heckman, J.J., Pinto, R., Zanolini, A., Vermeersch, C., Walker, S., Chang, S.M., and Grantham-McGregor, S. **(2014)** "Labor market returns to an early childhood stimulation intervention in Jamaica," *Science*, vol. 344, issue 6187, pp. 998-1001.

- Glewwe, P., Jacoby, H., and King, E.M. **(2001)** "Early childhood nutrition and academic achievement: A longitudinal analysis," *Journal of Public Economics*, vol. 81, issue 3, pp. 345-468.
- Goldberg L.R. **(1993)** "The structure of phenotypic personality traits". *The American Psychologist*. vol. 48, issue 1, pp. 2634
- Heckman, J.J. **(2006)** "Skill Formation and the Economics of Investing in Disadvantaged Children," *Science*, vol. 312, issue 5782, pp. 1900-19902.
- Heckman, James J., Jora Stixrud, and Sergio Urza. **2006**. The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior. *Journal of Labor Economics* vol. 24, issue 3, pp. 41182.
- Heckman, J.J. **(2008)** "Schools, Skills, and Synapses," *Economic Inquiry*, vol. 46, no. 3, pp. 289-324.
- Heckman, J.J., Pinto, R., Savelyev, P. **(2013)** "Understanding the Mechanisms through Which an Influential Early Childhood Program Boosted Adult Outcomes," *American Economic Review*, vol. 103, no. 6, pp. 2052, 2086.
- Heckman, J.J. and Pinto, R. **(2015)** "Econometric Mediation Analysis: Identifying the Sources of Treatment Effects from Experimentally Estimated Production Technologies with Unmeasured and Mismeasured Inputs," *Econometric Reviews*, vol. 34, issue 1-2, pp. 6-31.
- Imai, K., L. Keele, and T. Yamamoto **(2010)** "Identification, inference and sensitivity analysis for causal mediation effects," *Statistical Science*, vol. 25 no. 1, pp. 51-71.
- Imai, K., L. Keele, D. Tingley, and T. Yamamoto **(2011)** "Unpacking the black box of causality: Learning about causal mechanisms from experimental and observational studies, *American Political Science Review*, vol. 105, no. 4, pp. 765-789.
- Jensen, R. **(2010)** "The (Perceived) Returns to Education and the Demand for Schooling," *The Quarterly Journal of Economics*, vol. 125, issue 2, pp. 515-548.
- John, O.P. and Srivastava, S. **(1999)** "The Big-Five trait taxonomy: History, measurement, and theoretical perspectives," in Pervin, L.A. and John O.P. (eds.), *Handbook of personality: Theory and research*, vol. 2, pp. 102-138. New York: Guilford Press
- Kling, J.R., Liebman, J.B., and Katz, L.F. **(2007)** "Experimental Analysis of Neighborhood Effects," *The Quarterly Journal of Economics*, vol. 75, issue 1 pp. 83-119.
- Maluccio, J.A., Hoddinott, J., Behrman, J.R., Martorell, R., Quisumbing, A.R., and Stein, A. **(2009)** "The Impact of Improving Nutrition During Early Childhood on Education among Guatemalan Adults," *The Economic Journal*, vol. 119, issue 537, pp. 734-763.

- Miguel, E. and Kremer, M. (2004) "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities," *Econometrica*, vol. 72, no. 1, pp. 159-217.
- Nores, M. and Barnett, W.S. (2010) "Benefits of early childhood interventions across the world: (Under)Investing in the very young," *Economics of Education Review*, vol. 29, issue 2, pp. 271-282.
- Muralidharan, K. and Sundararaman, V. (2015) "The aggregate effect of school choice: Evidence from a two-stage experiment in India," *The Quarterly Journal of Economics*, vol. 130, no. 3, pp. 1011-1066.
- Oster, E. (2017) "Unobservable Selection and Coefficient Stability: Theory and Evidence," *Journal of Business and Economics Statistics*, available online.
- Preacher, K.J. and Selig, J.P. (2012) "Advantage of Monte Carlo Confidence Intervals for Indirect Effects," *Communication Methods and Measures*, vol. 6, issue 2, pp. 77-98.
- Rao, N., Sun, J., Pearson, V., Pearson, E., Liu, H., Conostas, M. A., et al. (2012) "Is Something Better than Nothing? An Evaluation of Early Childhood Programs in Cambodia," *Child Development*, vol. 83 no. 3, pp.864-876.
- Tabarrok, A. (2011) "Private Education in India: A Novel Test of Cream Skimming," *Contemporary Economic Policy*, vol. 31, issue 1, pp. 1-12.
- UNESCO (2015) "Education for All 2015 National Review Report: Philippines," available online: <https://unesdoc.unesco.org/ark:/48223/pf0000230331>.
- World Bank (2016) "Assessing Basic Education Service Delivery in the Philippines: The Philippines Public Education Expenditure Tracking and Quantitative Service Delivery Study," available online: <http://documents.worldbank.org/curated/en/507531468325807323/pdf/AUS6799-REVISED-PH-PETS-QSDS-Final-Report.pdf>
- Wamalwa, F.M. and Burns, J. (2018) "Private schools and student learning achievements in Kenya," *Economics of Education Review*, vol. 66, pp. 114-124.
- Wydick, B., Glewwe, P., and Rutledge, L. (2013) "Does International Child Sponsorship Work? A Six-Country Study of Impacts on Adult Life Outcomes," *Journal of Political Economy*, vol. 121, no. 2, pp. 393-436.

Table 1: Summary Statistics

Panel A: Household Variables	Mean	Std. Dev.	Obs.
HH income	5,028	4,325	1,104
IHS HH income ^a	9.00	0.72	1,104
HH size	5.89	2.39	1,131
Mother's age	43.71	10.68	1,132
Mother attended high school	0.46	0.50	1,132
Mother attended college	0.11	0.31	1,132
Mother married	0.86	0.35	1,132
Mother "stay-at-home"	0.57	0.49	1,132
Mother graduated VHL	0.83	0.37	1,132
Panel B: Child Variables	Mean	Std. Dev.	Obs.
Child age			
Jumpstart	11.67	2.33	650
Gov't Kindergarten	9.56	2.65	839
No Kindergarten	18.92	6.87	1,203
Child current grade			
Jumpstart	5.90	2.03	627
Gov't Kindergarten	4.19	2.36	821
No Kindergarten	9.57	2.40	677
Sex of Child (1 = Male)			
Jumpstart	0.51	0.50	650
Gov't Kindergarten	0.54	0.50	839
No Kindergarten	0.57	0.49	1,203
Performed best in third grade			
Jumpstart	0.56	0.50	650
Gov't Kindergarten	0.30	0.46	839
No Kindergarten	0.28	0.45	1,203
Performed best in elementary school			
Jumpstart	0.55	0.50	650
Gov't Kindergarten	0.33	0.47	839
No Kindergarten	0.30	0.46	1,203
Placed in top third grade section ^b			
Jumpstart	0.46	0.50	650
Gov't Kindergarten	0.39	0.49	839
No Kindergarten	0.39	0.49	1,203
Child currently enrolled in school			
Jumpstart	0.96	0.18	650
Gov't Kindergarten	0.98	0.14	839
No Kindergarten	0.56	0.50	1,203

Notes: ^aIHS is the inverse hyperbolic sine transformation. This is a "log-like" function that is capable of computing zero values.

^bThe variable identifying children placed in the top third grade section includes predicted values for missing information due to item non-response.

Figure 1: Enrollment Rates at Age when Kindergarten Entered Village

Notes: In this figure the darker bars represent the enrollment rate in Jumpstart kindergarten at each age when the Jumpstart program entered each village. The lighter bars represent the enrollment rate in government kindergarten at each age when the Kindergarten Education Act was passed in 2011.

Table 2: Effects on Primary Outcomes — OLS and IV Estimates

	Performed Best in Third Grade		Performed Best in Elementary		Placed in Top Third Grade Section		Currently Enrolled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Jumpstart	0.350*** (0.0563)	0.586*** (0.0629)	0.254*** (0.0530)	0.432*** (0.0735)	0.1965*** (0.0360)	0.1864*** (0.0537)	0.0923* (0.0531)	0.233*** (0.0609)
Gov't kindergarten	0.0118 (0.0538)	-0.101 (0.0732)	0.00281 (0.0558)	-0.103 (0.0646)	0.1600*** (0.0355)	0.1508*** (0.0485)	0.0270 (0.0542)	-0.0837* (0.0454)
Jumpstart = Gov't test (p-value)	0.000	0.000	0.000	0.000	0.413	0.543	0.026	0.000
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,482	2,482
R-squared	0.321	0.286	0.259	0.236	0.670	0.670	0.641	0.609
Weak IV test								
Jumpstart (F-stat)		428.28		428.28		428.28		428.28
Gov't kindergarten (F-stat)		39.20		39.20		39.20		39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results are relative to a child who did not attend kindergarten. Child controls include the child's age, the sex of the child, and birth order dummy variables. In columns (7) and (8), the sample is trimmed to include only "school aged" children, aged 4 through 24. In columns (1) through (4) and (7) through (8) standard errors are clustered at the village level. In columns (5) and (6) standard errors are bootstrapped with 1000 replications. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effects on Psychological Attributes — OLS and IV Estimates

	Grit index		Peer affiliation index		Self control index		Self identity index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Jumpstart	0.161** (0.0703)	0.221*** (0.0748)	0.161* (0.0861)	0.280** (0.115)	0.152** (0.0698)	0.213** (0.101)	0.158* (0.0837)	0.199* (0.104)
Gov't kindergarten	0.0858 (0.0678)	0.0763 (0.0593)	0.0305 (0.0781)	0.125* (0.0672)	0.0738 (0.0575)	0.124* (0.0753)	0.0757 (0.0905)	0.0286 (0.0823)
Jumpstart = Gov't test (p-value)	0.340	0.117	0.092	0.198	0.300	0.443	0.292	0.146
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.809	0.809	0.783	0.782	0.784	0.784	0.761	0.761
Weak IV test								
Jumpstart (F-stat)		428.28		428.28		428.28		428.28
Gov't kindergarten (F-stat)		39.20		39.20		39.20		39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Child controls and household/mother controls are the same as reported in Table 2. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Effects on Behavior, Spirituality, and Academic Indices — OLS and IV Estimates

	Behavior index		Spirituality index		Academic expectations index		Academic skills index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Jumpstart	0.0262	0.0863	0.00278	0.0195	0.108	0.240**	0.212*	0.279**
	(0.0441)	(0.0611)	(0.0707)	(0.0793)	(0.100)	(0.109)	(0.107)	(0.125)
Gov't kindergarten	-0.0331	-0.0520	0.0520	0.0783	0.106	0.169**	0.166*	0.276***
	(0.0478)	(0.0443)	(0.0483)	(0.0623)	(0.0653)	(0.0839)	(0.0853)	(0.0840)
Jumpstart = Gov't test (p-value)	0.242	0.048	0.385	0.517	0.984	0.618	0.662	0.981
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,482	2,482
R-squared	0.903	0.903	0.835	0.835	0.734	0.733	0.652	0.651
Weak IV test								
Jumpstart (F-stat)		428.28		428.28		428.28		428.28
Gov't kindergarten (F-stat)		39.20		39.20		39.20		39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Child controls and household/mother controls are the same as reported in Table 2. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effects on “Big 5” Attributes — OLS and IV Estimates

	Openness index		Conscientiousness index		Extraversion index		Agreeableness index		Reverse(Neuroticism) index	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV	(7) OLS	(8) IV	(9) OLS	(10) IV
Jumpstart	0.153 (0.0979)	0.282** (0.128)	0.211** (0.0856)	0.323*** (0.109)	0.0750 (0.0825)	0.158 (0.103)	0.102 (0.0719)	0.174* (0.102)	-0.00328 (0.0487)	-0.0794 (0.0548)
Gov’t kindergarten	0.0839 (0.0794)	0.0769 (0.0893)	0.0977 (0.0723)	0.112 (0.0720)	0.0223 (0.0635)	0.0565 (0.0599)	0.0151 (0.0719)	0.0420 (0.0583)	0.0145 (0.0485)	0.0674 (0.0504)
Jumpstart = Gov’t test (p-value)	0.422	0.157	0.239	0.095	0.516	0.377	0.193	0.206	0.705	0.026
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.685	0.684	0.735	0.734	0.780	0.780	0.794	0.793		
Weak IV test										
Jumpstart (F-stat)		428.28		428.28		428.28		428.28		428.28
Gov’t kindergarten (F-stat)		39.20		39.20		39.20		39.20		39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Figure 2: Second-Stage Mediation Results, Core Indices

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. Tables showing the individual regressions behind these figures are in the appendix.

Figure 3: Second-Stage Mediation Results, “Big 5” Indices

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. Tables showing the individual regressions behind these figures are in the appendix.

Table 6: 95% Confidence Intervals of Indirect Effects

	Performed best in third grade (1)	Performed best in elementary (2)	Placed in top section (3)	Currently enrolled (4)
Panel A: Core indices				
Grit index	[-0.0028; 0.0301]	[-0.0205; 0.0162]	[-0.0110; 0.0089]	[-0.0028; 0.0095]
Peer affiliation index	[-0.0273; 0.0096]	[-0.0359; 0.0062]	[-0.0034; 0.0271]	[-0.0131; 0.0091]
Self-control index	[-0.0037; 0.0257]	[0.0008; 0.0387]	[-0.0029; 0.0203]	[-0.0027; 0.0153]
Self-identity index	[-0.0233; 0.0023]	[-0.0092; 0.0140]	[-0.0045; 0.0135]	[-0.0120; 0.0021]
Behavior index	[-0.0178; 0.0024]	[-0.0076; 0.0087]	[-0.0076; 0.0046]	[-0.0095; 0.0013]
Spirituality index	[-0.0118; 0.0159]	[-0.0114; 0.0158]	[-0.0065; 0.0089]	[-0.0065; 0.0088]
Panel B: Alternative “Big 5” indices				
Openness index	[-0.0097; 0.0319]	[-0.0097; 0.0319]	[0.0033; 0.0289]	[-0.0077; 0.0097]
Conscientiousness index	[0.0009; 0.0485]	[-0.0091; 0.0277]	[-0.0154; 0.0145]	[-0.0013; 0.0180]
Extraversion index	[-0.0209; 0.0061]	[-0.0053; 0.0182]	[-0.0049; 0.0212]	[-0.0023; 0.0133]
Agreeableness index	[-0.0157; 0.0101]	[-0.0204; 0.0080]	[-0.0050; 0.0067]	[-0.0063; 0.0021]
Reverse(neuroticism) index	[-0.0118; 0.0036]	[-0.0019; 0.0168]	[-0.0044; 0.0056]	[-0.0070; 0.0052]
All “Big 5”	[-0.0143; 0.0580]	[-0.0115; 0.0563]	[-0.0025; 0.0461]	[-0.0067; 0.0271]

Notes: We calculate these confidence intervals using the Monte Carlo approach detailed by Preacher and Selig (2012). Figures showing the distributions of these indirect effects are presented in the appendix.

Supplemental Appendix

The supplemental appendix includes additional tables and figures that support the results presented and discussed in the main manuscript.

Tables A1 through A4 show OLS and village fixed effects estimates and show robustness of the results reported in Tables 2 through 5 in the main manuscript.

Table A5 shows summary statistics of each of the potential mediating index variables. Each of these indices are constructed using the methods of Kling et al. (2017), so each variable has a mean of zero and a standard deviation of one.

Table A6 show results of unobservable selection and coefficient stability tests on select indirect effects, using the methods of Oster (2017).

Tables A7 through A14 show the second-stage mediation effects summarized in Figures 2 and 3 in the main manuscript.

Figures A1 through A8 show the Monte Carlo distribution of the indirect effects, summarized in Table 6 in the main manuscript.

Tables A15 and A16 report the individual survey questions used to construct the various index variables used in this analysis.

Table A1: Effects on Primary Outcomes — OLS and Village FE Estimates

	Performed Best in Third Grade		Performed Best in Elementary		Placed in Top Third Grade Section		Currently Enrolled	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Jumpstart	0.276*** (0.0284)	0.322*** (0.0311)	0.230*** (0.0258)	0.265*** (0.0302)	0.195*** (0.0256)	0.226*** (0.0259)	0.0998*** (0.0310)	0.106*** (0.0332)
Gov't kindergarten	0.0445 (0.0271)	0.0206 (0.0294)	0.0412 (0.0259)	0.0224 (0.0274)	0.1778*** (0.0269)	0.1561*** (0.0243)	0.0438 (0.0349)	0.0459 (0.0347)
Jumpstart = Gov't test (p-value)	0.000	0.000	0.000	0.000	0.672	0.018	0.000	0.008
Observations	2,631	2,631	2,631	2,631	2,631	2,631	2,425	2,425
R-squared	0.181	0.207	0.140	0.159	0.089	0.275	0.273	0.341
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Results are relative to a child who did not attend kindergarten. Child controls include the child's age, the sex of the child, and birth order dummy variables. Household/mother controls include household income, household size, mother's age, dummy variables indicating if the mother has attended either high school or college, mother's marital status, a dummy variable indicating if the mother is a "stay at home" mom, and a dummy variable indicating if the mother graduated from ICM's "Transform" program. In columns (7) and (8), the sample is trimmed to include only "school aged" children, aged 4 through 24. In columns (1) through (4) and (7) through (8) standard errors are clustered at the village level. In columns (5) and (6) standard errors are bootstrapped with 1000 replications. *** p<0.01, ** p<0.05, * p<0.1

Table A2: Effects on Psychological Attributes — OLS and Village FE Estimates

	Grit index		Peer affiliation index		Self control index		Self identity index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Jumpstart	0.227*** (0.0859)	0.0395 (0.0579)	0.178** (0.0690)	0.0626 (0.0606)	0.262*** (0.0689)	0.0878 (0.0636)	0.0889 (0.0873)	0.00352 (0.0572)
Gov't kindergarten	-0.0544 (0.0827)	0.0469 (0.0544)	0.0427 (0.0669)	0.0705 (0.0596)	0.00988 (0.0739)	0.0952* (0.0550)	-0.0670 (0.0697)	-0.0351 (0.0647)
Jumpstart = Gov't test (p-value)	0.007	0.908	0.102	0.901	0.006	0.902	0.088	0.516
Observations	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631
R-squared	0.049	0.429	0.027	0.247	0.042	0.291	0.017	0.275
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Child controls and household/mother controls are the same as reported in Table 2. Standard errors are clustered at the village level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A3: Effects on Behavior, Spirituality, and Academic Skills — OLS and Village FE Estimates

	Behavior index		Spiritual index		Academic index		Scholastic index	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Jumpstart	0.0736 (0.0748)	-0.0762 (0.0635)	0.0757 (0.0787)	0.0631 (0.0660)	0.0737 (0.0838)	0.0401 (0.0765)	0.199** (0.0805)	0.132* (0.0788)
Gov't kindergarten	-0.0954 (0.0769)	-0.0393 (0.0657)	0.133* (0.0701)	0.0871 (0.0590)	-0.0370 (0.0760)	0.0739 (0.0665)	0.0765 (0.0675)	0.138** (0.0671)
Jumpstart = Gov't test (p-value)	0.079	0.551	0.526	0.633	0.219	0.651	0.118	0.934
Observations	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631
R-squared	0.024	0.421	0.045	0.326	0.035	0.207	0.035	0.150
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Child controls and household/mother controls are the same as reported in Table 2. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A4: Effects on Big Five Attributes — OLS and Village Fixed Effect Estimates

	Openness		Conscientiousness		Extraversion		Agreeableness		Reverse(Neuroticism)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS
Jumpstart	0.146*	0.0769	0.256***	0.0722	0.144**	0.0359	0.189**	0.0348	0.0300	-0.0716
	(0.0835)	(0.0649)	(0.0799)	(0.0667)	(0.0692)	(0.0597)	(0.0762)	(0.0694)	(0.0894)	(0.0729)
Gov't kindergarten	0.0131	0.0411	-0.0624	0.0467	0.00552	0.0588	0.00954	0.0604	-0.0437	-0.0132
	(0.0706)	(0.0669)	(0.0797)	(0.0609)	(0.0655)	(0.0554)	(0.0737)	(0.0598)	(0.0809)	(0.0681)
Jumpstart = Gov't test (p-value)	0.120	0.582	0.001	0.711	0.104	0.727	0.060	0.707	0.378	0.284
Observations	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631	2,631
R-squared	0.044	0.243	0.048	0.322	0.021	0.222	0.025	0.247	0.021	0.390
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household/mother controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Village fixed effects	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Child controls and household/mother controls are the same as reported in Table 2. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A5: Summary Statistics, Potential Mediating Variables — Kling et al. (2007) Index

Panel A: Core Variables	Mean	Std. Dev.	Obs.
Grit index	0.00	1	2,962
Peer-affiliation index	0.00	1	2,962
Self-control index	0.00	1	2,692
Self-identity index	0.00	1	2,962
Behavior index	0.00	1	2,962
Spiritual index	0.00	1	2,692
Academic index	0.00	1	2,692
Scholastic index	0.00	1	2,692
Panel B: Alternative “Big 5” Variables	Mean	Std. Dev.	Obs.
Openness index	0.00	1	2,692
Conscientiousness	0.00	1	2,692
Extraversion index	0.00	1	2,692
Agreeableness	0.00	1	2,692
Rev(Neuroticism)	0.00	1	2,692

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). This method first standardizes each of the components for each index and then, after summing the components of an index together, standardizes the aggregated index.

Table A6: Unobservable Selection and Coefficient Stability Tests on Indirect Effects

	Performed Best in Elementary		Performed Best in Third Grade		Placed in Top Third Grade Section	
	(1)	(2)	(3)	(4)	(5)	(6)
Self-control index	0.0020 (0.0063)	0.0813** (0.0320)				
Conscientiousness index			-0.0082 (0.0077)	0.0766** (0.0364)		
Openness index					0.0665*** (0.0141)	0.0634** (0.0255)
Oster's δ		-3.125		-1.433		0.458
Observations	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.044	0.268	0.061	0.326	0.022	0.680
Jumpstart enrollment	Yes	Yes	Yes	Yes	Yes	Yes
Gov't kindergarten enrollment	Yes	Yes	Yes	Yes	Yes	Yes
Child controls	No	Yes	No	Yes	No	Yes
Household/mother fixed effects	No	Yes	No	Yes	No	Yes

Notes: In this table we only assess the robustness of the statistically significant indirect effects (presented in column (9) in Tables 6 and 7 and column (8) in Tables 9 and 10), since it is unreasonable to assess whether the observed non-relationship is driven by omitted variables. The δ parameter is estimated following the procedures described by Altonji, Elder, and Taber (2005) and Oster (2017) and represents the proportional selection coefficient. Each of the indices are standardized using the technique used by Kling et al. (2007). Child controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A7: Second-Stage Mediation Effects on Performance in Third Grade, Core Mediators — OLS and IV Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV
Grit index	0.0292 (0.0306)								0.0521 (0.0404)	0.0488 (0.0323)
Peer affiliation index		0.00961 (0.0284)							-0.00652 (0.0373)	-0.0240 (0.0286)
Self-control index			0.0368 (0.0248)						0.0433 (0.0347)	0.0372 (0.0279)
Behavior index				-0.0367 (0.0396)					-0.0574 (0.0426)	-0.0631* (0.0327)
Spiritual index					0.0270 (0.0312)				0.0546 (0.0453)	0.0797** (0.0328)
Self-identity index						-0.0192 (0.0281)			-0.0269 (0.0306)	-0.0376 (0.0236)
Academic index							-0.00759 (0.0320)		-0.0130 (0.0475)	-0.00827 (0.0356)
Scholastic index								-0.0112 (0.0236)	-0.0442 (0.0350)	-0.0498* (0.0275)
Jumpstart (Direct effect)	0.346*** (0.0581)	0.349*** (0.0569)	0.345*** (0.0562)	0.351*** (0.0562)	0.350*** (0.0561)	0.353*** (0.0559)	0.351*** (0.0562)	0.353*** (0.0569)	0.353*** (0.0562)	0.601*** (0.0621)
Gov't kindergarten (Direct effect)	0.00929 (0.0536)	0.0115 (0.0537)	0.00908 (0.0530)	0.0106 (0.0541)	0.0104 (0.0538)	0.0132 (0.0536)	0.0126 (0.0538)	0.0137 (0.0543)	0.0103 (0.0533)	-0.0995 (0.0696)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.322	0.321	0.322	0.322	0.322	0.321	0.321	0.321	0.327	0.291
Weak IV test										
Jumpstart (F-stat)										428.28
Gov't kindergarten (F-stat)										39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A8: Second-Stage Mediation Effects on Performance in Elementary, Core Mediators — OLS and IV Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV
Grit index	0.0286 (0.0253)								-0.00516 (0.0373)	-0.00744 (0.0286)
Peer affiliation index		0.0289 (0.0343)							-0.0261 (0.0432)	-0.0400 (0.0325)
Self-control index			0.0848*** (0.0249)						0.0813** (0.0320)	0.0767*** (0.0253)
Behavior index				0.0192 (0.0440)					0.00789 (0.0473)	0.00293 (0.0358)
Spiritual index					0.0743** (0.0361)				0.0513 (0.0527)	0.0706* (0.0399)
Self-identity index						0.0404 (0.0300)			0.0161 (0.0336)	0.00782 (0.0247)
Academic index							0.0481* (0.0278)		0.0365 (0.0389)	0.0402 (0.0285)
Scholastic index								0.0262 (0.0216)	-0.0395 (0.0381)	-0.0434 (0.0290)
Jumpstart (Direct effect)	0.250*** (0.0536)	0.250*** (0.0538)	0.241*** (0.0531)	0.254*** (0.0529)	0.254*** (0.0521)	0.248*** (0.0532)	0.249*** (0.0529)	0.249*** (0.0543)	0.249*** (0.0526)	0.432*** (0.0759)
Gov't kindergarten (Direct effect)	0.000355 (0.0554)	0.00193 (0.0556)	-0.00345 (0.0546)	0.00344 (0.0560)	-0.00105 (0.0555)	-0.000250 (0.0563)	-0.00230 (0.0557)	-0.00155 (0.0564)	-0.00288 (0.0556)	-0.108* (0.0638)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.259	0.259	0.265	0.259	0.262	0.260	0.261	0.260	0.268	0.245
Jumpstart (F-stat)										428.28
Gov't kindergarten (F-stat)										39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A9: Second-Stage Mediation Effects on Placed in Top Section, Core Mediators — OLS and IV Estimates

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV
Grit index	0.0488*								-0.00451	-0.00415
	(0.0281)								(0.0278)	(0.0209)
Peer-affiliation index		0.0729**							0.0321	0.0322
		(0.0283)							(0.0296)	(0.0226)
Self-control index			0.0696**						0.0291	0.0294
			(0.0294)						(0.0291)	(0.0220)
Behavioral index				0.0122					-0.00941	-0.00979
				(0.0349)					(0.0351)	(0.0265)
Spiritual index					0.0863***				0.0366	0.0360
					(0.0286)				(0.0355)	(0.0268)
Self-identity index						0.0481**			0.0151	0.0154
						(0.0228)			(0.0242)	(0.0180)
Academic index							0.0480***		-0.0309	-0.0310
							(0.0175)		(0.0262)	(0.0198)
Scholastic index								0.0631***	0.0426*	0.0431**
								(0.0162)	(0.0236)	(0.0177)
Jumpstart	0.192***	0.189***	0.190***	0.200***	0.200***	0.193***	0.195***	0.187***	0.183***	0.169***
(Direct effect)	(0.0491)	(0.0489)	(0.0489)	(0.0486)	(0.0483)	(0.0473)	(0.0487)	(0.0486)	(0.0497)	(0.0496)
Gov't kindergarten	0.162***	0.164***	0.161***	0.166***	0.161***	0.162***	0.161***	0.155***	0.156***	0.140***
(Direct effect)	(0.0506)	(0.0508)	(0.0499)	(0.0495)	(0.0491)	(0.0483)	(0.0499)	(0.0497)	(0.0494)	(0.0475)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.672	0.675	0.674	0.670	0.675	0.672	0.673	0.676	0.679	0.679
Jumpstart (F-stat)										428.28
Gov't kindergarten (F-stat)										39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A10: Second-Stage Mediation Effects on Current Enrollment, Core Mediators — OLS and IV Estimates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) IV
Grit index	-0.00261 (0.0144)								0.0151 (0.0164)	0.0120 (0.0127)
Peer Affiliation index		0.000741 (0.0176)							0.00703 (0.0230)	-0.00521 (0.0176)
Self-control index			0.0121 (0.0163)						0.0251 (0.0219)	0.0213 (0.0170)
Behavioral index				-0.0203 (0.0249)					-0.0261 (0.0252)	-0.0314 (0.0191)
Spiritual index					-0.00155 (0.0216)				0.0233 (0.0263)	0.0400* (0.0212)
Self-identity index						-0.0157 (0.0170)			-0.00921 (0.0165)	-0.0167 (0.0137)
Academic index							-0.0165 (0.0205)		-0.00244 (0.0237)	0.00378 (0.0182)
Scholastic index								-0.0247 (0.0188)	-0.0449* (0.0245)	-0.0495*** (0.0188)
Jumpstart (Direct effect)	0.0927* (0.0533)	0.0922* (0.0536)	0.0909* (0.0530)	0.0933* (0.0532)	0.0923* (0.0531)	0.0942* (0.0537)	0.0935* (0.0534)	0.0958* (0.0533)	0.0957* (0.0530)	0.246*** (0.0590)
Gov't kindergarten (Direct effect)	0.0272 (0.0542)	0.0270 (0.0542)	0.0266 (0.0538)	0.0268 (0.0541)	0.0271 (0.0543)	0.0275 (0.0541)	0.0284 (0.0546)	0.0292 (0.0544)	0.0287 (0.0529)	-0.0795* (0.0424)
Observations	2,482	2,482	2,482	2,482	2,482	2,482	2,482	2,482	2,482	2,482
R-squared	0.641	0.641	0.641	0.641	0.641	0.641	0.641	0.642	0.645	0.611
Jumpstart (F-stat)										428.28
Gov't kindergarten (F-stat)										39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The sample is trimmed to include only “school aged” children, aged 4 through 24. Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A11: Second-Stage Mediation Effects on Performance in Third Grade, Big 5 Characteristics — OLS and IV Estimates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) IV
Openness index	0.0148 (0.0244)							0.0323 (0.0371)	0.0290 (0.0271)
Conscientiousness index		0.0324 (0.0228)						0.0766** (0.0364)	0.0635** (0.0301)
Extraversion index			-0.00787 (0.0285)					-0.0332 (0.0444)	-0.0297 (0.0317)
Agreeableness index				0.00282 (0.0301)				-0.00505 (0.0397)	-0.0109 (0.0298)
Reverse(Neuroticism) index					-0.0271 (0.0411)			-0.0329 (0.0461)	-0.0319 (0.0346)
Academic index						-0.00759 (0.0320)		-0.0211 (0.0492)	-0.0117 (0.0372)
Scholastic index							-0.0112 (0.0236)	-0.0507 (0.0375)	-0.0525* (0.0287)
Jumpstart (Direct effect)	0.348*** (0.0561)	0.344*** (0.0581)	0.351*** (0.0566)	0.350*** (0.0564)	0.350*** (0.0561)	0.351*** (0.0562)	0.353*** (0.0569)	0.345*** (0.0557)	0.576*** (0.0604)
Gov't kindergarten (Direct effect)	0.0106 (0.0539)	0.00862 (0.0533)	0.0120 (0.0538)	0.0117 (0.0538)	0.0122 (0.0539)	0.0126 (0.0538)	0.0137 (0.0543)	0.0136 (0.0535)	-0.0889 (0.0704)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.321	0.322	0.321	0.321	0.321	0.321	0.321	0.326	0.294
Weak IV test									
Jumpstart (F-stat)									428.28
Gov't kindergarten (F-stat)									39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A12: Second-Stage Mediation Effects on Performance in Elementary, Big 5 Characteristics — OLS and IV Estimates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) IV
Openness index	0.0387 (0.0282)							0.0306 (0.0434)	0.0281 (0.0305)
Conscientiousness index		0.0505** (0.0211)						0.0335 (0.0315)	0.0232 (0.0259)
Extraversion index			0.0491* (0.0288)					0.0231 (0.0373)	0.0256 (0.0277)
Agreeableness index				0.0339 (0.0322)				-0.0187 (0.0435)	-0.0239 (0.0322)
Reverse(Neuroticism) index					0.0255 (0.0406)			0.0696* (0.0394)	0.0711** (0.0291)
Academic index						0.0481* (0.0278)		0.0507 (0.0385)	0.0585** (0.0288)
Scholastic index							0.0262 (0.0216)	-0.0326 (0.0387)	-0.0332 (0.0285)
Jumpstart (Direct effect)	0.248*** (0.0524)	0.244*** (0.0534)	0.251*** (0.0529)	0.251*** (0.0531)	0.254*** (0.0533)	0.249*** (0.0529)	0.249*** (0.0543)	0.244*** (0.0532)	0.417*** (0.0745)
Gov't kindergarten (Direct effect)	-0.000438 (0.0555)	-0.00212 (0.0546)	0.00171 (0.0557)	0.00230 (0.0558)	0.00244 (0.0559)	-0.00230 (0.0557)	-0.00155 (0.0564)	-0.00425 (0.0553)	-0.113* (0.0647)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.261	0.261	0.261	0.260	0.259	0.261	0.260	0.265	0.243
Weak IV test									
Jumpstart (F-stat)									428.28
Gov't kindergarten (F-stat)									39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A13: Second-Stage Mediation Effects on Placed in Top Section, Big 5 Characteristics — OLS and IV Estimates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) IV
Openness index	0.0780*** (0.0186)							0.0634** (0.0255)	0.0636*** (0.0191)
Conscientiousness index		0.0585** (0.0259)						-0.000968 (0.0311)	-0.000385 (0.0236)
Extraversion index			0.0741** (0.0292)					0.0275 (0.0335)	0.0272 (0.0253)
Agreeableness index				0.0695*** (0.0263)				0.00615 (0.0337)	0.00605 (0.0255)
Reverse(neuroticism) index					-0.0401 (0.0305)			0.0146 (0.0323)	0.0150 (0.0243)
Academic index						0.0480*** (0.0175)		-0.0383 (0.0267)	-0.0385* (0.0201)
Scholastic index							0.0631*** (0.0162)	0.0381 (0.0252)	0.0386** (0.0189)
Jumpstart (Direct effect)	0.188*** (0.0466)	0.188*** (0.0487)	0.195*** (0.0485)	0.193*** (0.0483)	0.200*** (0.0484)	0.195*** (0.0487)	0.187*** (0.0486)	0.184*** (0.0480)	0.168*** (0.0475)
Gov't kindergarten (Direct effect)	0.159*** (0.0483)	0.160*** (0.0505)	0.164*** (0.0495)	0.165*** (0.0499)	0.166*** (0.0505)	0.161*** (0.0499)	0.155*** (0.0497)	0.157*** (0.0489)	0.145*** (0.0475)
Observations	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692	2,692
R-squared	0.678	0.674	0.675	0.674	0.671	0.673	0.676	0.680	0.680
Jumpstart (F-stat)									428.28
Gov't kindergarten (F-stat)									39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Table A14: Second-Stage Mediation Effects on Current Enrollment, Big 5 Characteristics — OLS and IV Estimates

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS	(7) OLS	(8) OLS	(9) IV
Openness index	-0.00430 (0.0166)							0.00718 (0.0246)	0.00423 (0.0184)
Conscientiousness index		0.00289 (0.0142)						0.0323* (0.0175)	0.0229 (0.0142)
Extraversion index			0.00383 (0.0183)					0.0173 (0.0201)	0.0182 (0.0148)
Agreeableness index				-0.00964 (0.0180)				-0.0103 (0.0225)	-0.0152 (0.0177)
Reverse(neuroticism) index					-0.0166 (0.0218)			-0.0343 (0.0230)	-0.0329** (0.0165)
Academic index						-0.0165 (0.0205)		-0.00977 (0.0237)	0.000742 (0.0180)
Scholastic index							-0.0247 (0.0188)	-0.0505* (0.0260)	-0.0516*** (0.0195)
Jumpstart (Direct effect)	0.0928* (0.0536)	0.0919* (0.0533)	0.0921* (0.0533)	0.0933* (0.0536)	0.0924* (0.0530)	0.0935* (0.0534)	0.0958* (0.0533)	0.0941* (0.0521)	0.233*** (0.0583)
Gov't kindergarten (Direct effect)	0.0272 (0.0544)	0.0269 (0.0541)	0.0270 (0.0542)	0.0271 (0.0542)	0.0273 (0.0541)	0.0284 (0.0546)	0.0292 (0.0544)	0.0310 (0.0530)	-0.0729* (0.0434)
Observations	2,482	2,482	2,482	2,482	2,482	2,482	2,482	2,482	2,482
R-squared	0.641	0.641	0.641	0.641	0.641	0.641	0.642	0.645	0.615
Jumpstart (F-stat)									428.28
Gov't kindergarten (F-stat)									39.20
Child controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The sample is trimmed to include only “school aged” children, aged 4 through 24. Each of the indices are standardized using the technique used by Kling et al. (2007). Results are relative to a child who did not attend kindergarten. Controls include the child age, the sex of the child, and birth order dummy variables. Standard errors are clustered at the village level. *** p<0.01, ** p<0.05, * p<0.1

Figure A1: Distribution of Indirect Effects — Core Mediators on Performance in Third Grade

(a) Grit Index

(b) Peer-affiliation Index

(c) Self-control Index

(d) Behavior Index

(e) Spiritual Index

(f) Self-identity Index

Figure A2: Distribution of Indirect Effects — Core Mediators on Performance in Elementary

(a) Grit Index

(b) Peer-affiliation Index

(c) Self-control Index

(d) Behavior Index

(e) Spiritual Index

(f) Self-identity Index

Figure A3: Distribution of Indirect Effects — Core Mediators on Probability Place in Top Section

Figure A4: Distribution of Indirect Effects — Core Mediators on Current Enrollment

(a) Grit Index

(b) Peer-affiliation Index

(c) Self-control Index

(d) Behavior Index

(e) Spiritual Index

(f) Self-identity Index

Figure A5: Distribution of Indirect Effects — Big 5 on Performance in Third Grade

Figure A6: Distribution of Indirect Effects — Big 5 on Performance in Elementary

(a) Openness

(b) Conscientiousness

(c) Extraversion

(d) Agreeableness

(e) Neuroticism

(f) All Big 5

Figure A7: Distribution of Indirect Effects — Big 5 on Probability in Top Third Grade Section

Figure A8: Distribution of Indirect Effects — Big 5 on Current Enrollment

(a) Openness

(b) Conscientiousness

(c) Extraversion

(d) Agreeableness

(e) Neuroticism

(f) All Big 5

Table A15: Survey Questions for the Index Variables

Panel A: Academic Indices	
Academic index ^b	How likely do you think it is that [child <i>i</i>] will finish high school?
	How likely do you think it is that [child <i>i</i>] will graduate from university?
	How likely do you think it is that [child <i>i</i>] will have a good job hen they are grown up?
	How likely do you think it is that [child <i>i</i>] will be generally successful in life?
Scholastic index ^b	Relative to others his/her age [child <i>i</i>] reads a lot.
	Relative to others his/her age [child <i>i</i>] practices math frequently.
	Relative to others his/her age [child <i>i</i>] has achieved/will achieve highly in school.
	Relative to others his/her age [child <i>i</i>] shows interest in learning languages.
	Relative to others his/her age [child <i>i</i>] is quite smart.
Panel B: Core Indices	
Grit index ^b	Relative to others his/her age [child <i>i</i>] is easily discouraged.
	Relative to others his/her age [child <i>i</i>] is a hard worker.
	Relative to others his/her age [child <i>i</i>], when setting goals, often changes their mind to a new goal.
	Relative to others his/her age [child <i>i</i>] has difficulty focusing on tasks that take longer than thirty minutes.
	Relative to others his/her age, once [child <i>i</i>] starts something, they will finish it.
	Relative to others his/her age [child <i>i</i>] is distracted easily.
Peer affiliation index ^b	Relative to others his/her age [child <i>i</i>] is patient.
	Relative to others his/her age [child <i>i</i>] can easily make a new friend.
	Relative to others his/her age [child <i>i</i>] often tries to avoid social situations.
	Relative to others his/her age [child <i>i</i>] gets into fights frequently.
	Relative to others his/her age [child <i>i</i>] comforts others when they are upset.
Behavior index ^b	Relative to others his/her age [child <i>i</i>] is often teased or bullied.
	Relative to others his/her age [child <i>i</i>] has often been disobedient at home and at school.
	Relative to others his/her age [child <i>i</i>] acts younger than his/her age.
	Relative to others his/her age [child <i>i</i>] is kind to other kids his/her age and younger.
Spirituality index ^b	Relative to others his/her age [child <i>i</i>] often breaks rules at home, school, or elsewhere.
	Relative to others his/her age [child <i>i</i>] participates in youth church group activities.
	Relative to others his/her age [child <i>i</i>] asks questions about God.
	Relative to others his/her age [child <i>i</i>] enjoys attending church.
Self control index ^b	Relative to others his/her age [child <i>i</i>] often asks to give the family's offering at church.
	Relative to others his/her age [child <i>i</i>] gets mad easily.
	Relative to others his/her age [child <i>i</i>] waits his/her turn to speak.
	Relative to others his/her age [child <i>i</i>] often yells or hits people when they are mad.
Positive identity index ^b	Relative to others his/her age [child <i>i</i>] can easily sit still for an hour at a time.
	Relative to others his/her age [child <i>i</i>] makes decisions quickly.
	Relative to others his/her age [child <i>i</i>] easily becomes upset if they can't do something correctly.
	Relative to others his/her age [child <i>i</i>] feels that they have value to others that is less than other children.
	Relative to others his/her age [child <i>i</i>] often talks about what they want to be when they are grown up.
	Relative to others his/her age [child <i>i</i>] talks about the future positively.

Notes: We construct each of these indices using the methodology of Kling et al. (2007). ^a These questions are answered on a 1 through 5 Likkert scale with one indicating “very unlikely” and five indicating “very likely.” ^b These questions are answered on a 1 through 5 Likkert scale with one indicating “strongly disagree” and five indicating “strongly agree.”

Table A16: Alternative Question Groupings for the “Big 5” Index Variables

Openness index	Relative to others his/her age [child i] often talks about what they want to be when they are grown up.
	Relative to others his/her age [child i] talks about the future positively.
	Relative to others his/her age [child i] asks questions about God.
	Relative to others his/her age [child i], when setting goals, often changes their mind to a new goal.
Conscientiousness index	Relative to others his/her age [child i] can easily sit still for an hour at a time.
	Relative to others his/her age [child i] waits his/her turn to speak.
	Relative to others his/her age [child i] is patient.
	Relative to others his/her age, once [child i] starts something, they will finish it.
	Relative to others his/her age [child i] is distracted easily.
	Relative to others his/her age [child i] has difficulty focusing on tasks that take longer than thirty minutes.
	Relative to others his/her age [child i] is a hard worker.
Extraversion index	Relative to others his/her age [child i] is easily discouraged.
	Relative to others his/her age [child i] often asks to give the family’s offering at church.
	Relative to others his/her age [child i] participates in youth church group activities.
	Relative to others his/her age [child i] often tries to avoid social situations.
Agreeableness index	Relative to others his/her age [child i] can easily make a new friend.
	Relative to others his/her age [child i] is often teased or bullied.
	Relative to others his/her age [child i] enjoys attending church.
	Relative to others his/her age [child i] often breaks rules at home, school, or elsewhere.
	Relative to others his/her age [child i] is kind to other kids his/her age and younger.
Neuroticism index	Relative to others his/her age [child i] has often been disobedient at home and at school.
	Relative to others his/her age [child i] comforts others when they are upset.
	Relative to others his/her age [child i] makes decisions quickly.
	Relative to others his/her age [child i] feels that they have value to others that is less than other children.
	Relative to others his/her age [child i] easily becomes upset if they can’t do something correctly.
	Relative to others his/her age [child i] often yells or hits people when they are mad.
	Relative to others his/her age [child i] gets mad easily.
	Relative to others his/her age [child i] is kind to other kids his/her age and younger.
	Relative to others his/her age [child i] gets into fights frequently.

Notes: We construct each of these indices using the methodology of Kling et al. (2007). These questions are answered on a 1 through 5 Likkert scale with one indicating “strongly disagree” and five indicating “strongly agree.”