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THE ANTECEDENTS AND OUTCOMES OF PRESCHOOL PROGRAMS FOR CHILDREN IN AMERICA

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THE ANTECEDENTS AND OUTCOMES OF PRESCHOOL
PROGRAMS FOR CHILDREN IN AMERICA

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Dedication

To my mother, Farah, my father, Rohe, my sister, Yasi, and my fiancée, Shadie. Each of you has supported me throughout all of my endeavors and believed in me even when I did not believe in myself.

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THE ANTECEDENTS AND OUTCOMES OF PRESCHOOL PROGRAMS FOR CHILDREN IN AMERICA

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There has been an increased interest in the early childhood years as a point of intervention and, specifically, on preschool programs, which hold great promise in preparing children for school. Despite the extensive body of literature on preschool education, there remain a number of key issues that need to be addressed to move the early childhood field forward. This dissertation addresses three of these areas that require continued attention. First, we need to know why Latino children from U.S.- and foreign-born households are under-enrolled in preschool education (Aim 1). The second area that we need to know more about is the potential long-term benefits of large-scale preschool programs (Aim 2). Finally, the third area where more information is needed is on the different sources of heterogeneity in the benefits of preschool for children (Aim 3). Thus, the aims of this dissertation were to address these gaps in the knowledge-base by using data from the Early Childhood Longitudinal Study Birth (ECLS-B) and Kindergarten (ECLS-K 1998) Cohorts. The first set of findings reveals that there are important differences that exist within the Latino population (culture, household resources, parents' beliefs about school readiness, and child elicitation) with respect to preschool selection. These differences indicate that, in order to boost the preschool enrollment of Latino children from U.S.- and foreign-born households, policymakers may need to focus on

targeting a specific set of barriers. Findings from Aim 2 underscore the potential long-term benefits of preschool education. Specifically, despite evidence for partial convergence of test scores, children who attended preschool at age four consistently outperformed their classmates who attended informal care in areas of academic achievement through the end of middle school. Although all children benefited from preschool participation, analyses from Aim 3 of this dissertation revealed that there was evidence for systematic heterogeneity, with findings supporting developmental theories on cumulative advantage and diverging destinies. Taken together, the results from this dissertation add to the existing evidence base on preschool education by highlighting new means of engaging families in the preschool market and underscoring both how and why preschool programs have long-term benefits for children.

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Chapter 1: Introduction

Socio-economic and racial/ethnic gaps in educational attainment are established early in the life course. As one example, national estimates reveal that disadvantaged children enter kindergarten scoring approximately two full years behind their more advantaged peers in areas of early language and literacy development (Bradbury, Corak, Waldfogel, & Washbrook, 2011), and once these children fall behind, they often stay behind (Reardon, 2011). The consequences of early disadvantage are life-long (Entwisle & Alexander, 1989), which is why understanding how children's early ecologies contribute to their educational prospects is a focus of interdisciplinary research. Despite the growing interest in preschool education, there remain a number of key issues that need to be addressed to move the early childhood field forward. This dissertation aims to address these issues with respect to the antecedents and outcomes of preschool programs as a means of minimizing disparities in children's school success.

Latino families constitute approximately 17% of the U.S. population and represent the fastest-growing sub-segment of the country; in fact by 2050, Latino families will constitute a third of the nation (Pew Research Center, 2015). Despite the large number of Latino families across the U.S., they are the least likely group to enroll their children in some form of non-parental care such as preschool in the year before kindergarten (Child Trends, 2012). Why Latino families utilize less formal child care arrangements remains contested. Some researchers have suggested that these decisions are rooted in familial and cultural values (Fuller & Garcia Coll, 2010), whereas others suggest that it is an issue of access (Ansari & Winsler, 2012; Yesil Degil, 2011). Much of

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this literature, however, has been unable to tease apart issues of nativity, country of origin, and mothers' and fathers' characteristics as determinants of whether children attend preschool. That is, although all parents want their children to succeed, their selection of preschool is likely to vary depending on several key factors, including family necessity, cultural experiences, financial resources, human capital factors, child elicitation, and community characteristics. Preschool selection, therefore, can manifest in different ways, especially for immigrant Latino families, who tend to have less experience in the U.S. educational system (Crosnoe, Ansari, Purtell, & Wu, 2016).

With the national push to expand preschool education (Duncan & Magnuson, 2013), it is not only necessary to understand why certain subgroups of children lag behind in preschool enrollment but also what the repercussions of this participation might be for children's short- and long-term school success. The assumptions behind these expansion efforts are that if children receive quality preschool education, then they will demonstrate greater gains in school readiness and thereby reduce group-based disparities in school achievement over time. Even so, these assumptions have not been explicitly examined in the extant literature. In fact, outside of a few experimental evaluations of small and intensive early intervention programs (Campbell et al., 2012; Schweinhart et al., 2005) and work done by the NICHD Network (Belsky et al., 2007; Vandell et al., 2010), little is known about the long-term benefits of preschool education for children's developmental outcomes as they transition into middle childhood and adolescence.

Finally, although policy-makers have long been interested in the "average" associations between intervention programs and children's developmental outcomes,

there has been growing interest in within-program heterogeneity (Duncan & Magnuson, 2013; Duncan & Vandell, 2012). By examining the heterogeneity of effects in preschool education and uncovering which children benefit the most, this empirical inquiry has the potential to increase the understanding of the processes involved in facilitating children's educational prospects, both in the short- and long-term (see also: Cooper & Lanza, 2014; Miller et al., 2014; Puma et al., 2012). Although this literature is extensive, it does not mean there is not more to learn. In fact, we know very little about the conditional effects of preschool education as a function of how likely children are to enroll.

Thus, the aims of this dissertation are threefold, which are divided into two separate—but related—standalone studies that cut across two chapters:

Aim 1: To characterize the preschool utilization behaviors of immigrant and U.S.-born Latino families during the year before kindergarten.

Aim 2: To determine whether parents' decisions about preschool have implications for their children's short- and long-term school success.

Aim 3: To assess the extent to which the benefits of preschool vary as a function of children's propensity for enrollment in such programs.

In addressing these objectives, this study is poised to address some important gaps in the literature by focusing on populations of interest in educational policy, while also exploring avenues for increasing the preschool participation of underserved populations. When taken together, these data will allow for the examination of children's development across various developmental stages and contexts and provide a deeper understanding of the processes involved in parents' decisions regarding their children's education.

Chapter 2: The Preschool Utilization

Behaviors of Immigrant and U.S.-born Latino Families

ABSTRACT

Latino families represent the fastest-growing minority population in the U.S., but they are also the least likely group to enroll their children in some form of non-parental care the year before kindergarten. Why Latino families, especially those born outside of the U.S., utilize less formal arrangements as opposed to preschool remains unclear. To address these gaps in knowledge, this study applies the accommodations framework to the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B; $n = 5,850$) to provide a more nuanced understanding of the preschool selection behaviors of U.S.- and foreign-born Latino families as compared with U.S.-born Black and White families. Results underscore the similarities and differences that exist in the preschool selection behaviors of different groups of families, while also highlighting important sources of selection differences that exist *within* the Latino population (e.g., culture, household resources, parental beliefs about school readiness, and child elicitation).

INTRODUCTION

There has been an increased focus on the early childhood years as a point of intervention, specifically on preschool programs, which hold great promise in preparing children for school and, ultimately, reducing the socio-demographic disparities in school

success (Duncan & Magnuson, 2013). Indeed, a large empirical literature has established

the effectiveness of preschool education in preparing children for kindergarten (Ansari &

Winsler, 2016; Bumgarner & Brooks-Gunn, 2014; Gormley et al., 2005; Weiland &

Yoshikawa, 2013; Winsler et al., 2008). These programs can also play an integral role in

shaping children's long-term school success, with encouraging evidence from classic

studies of early intervention programs (Campbell & Ramey, 1994; Schweinhart et al.,

2005; Reynolds, Temple, Robertson, & Mann, 2001) as well as some more recent

evaluations of large-scale preschool programs in Florida, North Carolina, and Oklahoma

(Ansari et al., in press; Hill et al., 2015; Muschkin, Ladd & Dodge, 2015). Early

childhood programs, therefore, can serve as actionable points of intervention to reduce

the intergenerational transmission of inequality.

Given that early education programs serve as a potential policy lever for reducing

school readiness disparities, Latino children in particular constitute an important group to

target for preschool enrollment. Nationally, 54% of all children attend a formal preschool

program at the age of 4 (Child Trends, 2012). However, the 44% enrollment rate of

Latino children is significantly lower than non-Latino White (57%) and Black (56%)

children (Child Trends, 2012). Why are Latino parents enrolling their children in

preschool at lower rates than other parents? To address this question, it is necessary to

consider the processes involved in parents' decision-making regarding preschool as

compared with informal care and parental care, which are two options that Latino

families use more often (Child Trends, 2012). In considering these processes from the

perspective of Latino parents, this dissertation is poised to uncover new avenues for intervention to increase Latino children's participation in preschool education.

BACKGROUND

Viewing Preschool Enrollment through the Lens of Latino Families

Unlike other populations in the U.S., the challenges Latino families face go beyond economic disadvantage; that is, economic hardship is compounded by the fact that Latino families must deal with additional cultural and linguistic barriers as well as unfamiliarity with the U.S. educational system (American Community Survey, 2012; Garcia & Jensen, 2007). Together, these factors might prevent Latino families from accessing quality preschool services (Crosnoe, 2007; Loeb et al., 2007) and, ultimately, shape their children's educational prospects (Ansari & Winsler, 2012; Reardon & Galindo, 2009). Latino parents may also underutilize formal early education programs because they have values and preferences that influence their choices (Fuller et al., 1996; Radey & Brewster, 2007). For example, prior research has shown that Latino families value the family context and cultural practices (Fuller & Garcia Coll, 2010) and, thus, their preferences for this cultural match may inhibit Latino parents from enrolling their children in preschool education (Zambrana & Morant, 2009). Instead, Latino parents may perceive informal child care arrangements to be more consistent with their values.

Despite this common belief that Latino parents prefer informal care arrangements, recent studies have disputed these claims and argue instead that the barrier is access (Ansari & Winsler, 2012; Hill-Scott, 2004; Yesil-Dagli, 2011; Zucker, Howes, Garza-

Mourino, 2006). Many Latino parents do express interest in preschool education for their children (Zucker et al., 2006) or enroll their children in formal programs when barriers are removed (Ansari & Winsler, 2012; Yesil-Dagli, 2011). In other words, family preference for informal care is likely to be only part of the story when examining the processes involved in Latino parents' decision-making for care. In fact, it is equally plausible that if Latino parents had access to programs that met their needs and values, then they might not differ from non-Latino families in their utilization of preschool.

Such possibilities are of particular importance for policy and practice, as Latino children make up a large portion of the population who are targeted by policy initiatives; thus, we need to know whether existing efforts are sufficient to address the needs of Latino families, or if the mechanisms for targeting Latino families should differ from other groups. That is, although much of the disparities in preschool enrollment map onto race/ethnicity and socio-economic status (Crosnoe, 2007), it remains possible that race/ethnicity conditions how different factors—that differ both *within* and *between* groups—influence families' selection of preschool for their children (Fuller et al., 1996; Huston et al., 2002; Radey & Brewster, 2007). In other words, to have the greatest impact, we not only need to know why Latino families are not using early education programs, but whether these reasons differ between different groups of families.

Although there has been growing interest in understanding the processes involved in preschool selection (Coley et al., 2014; Fuller et al., 1996; Ha, Magnuson, & Ybarra, 2012), prior studies have generally not differentiated these processes by race/ethnicity and/or nativity, and those that have (Daugherty, 2009; Yesil-Degli, 2011) have focused

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on Latino families without cross racial/ethnic group or within group comparisons (for an exception see Fuller et al., 1996). Without such comparisons, strong conclusions cannot be drawn about the reasons why Latino families choose less formal arrangements and whether these reasons are similar to (or different from) other populations. For example, we need to know how Latino families compare with the historically least advantaged (U.S.-born Black) and most advantaged (U.S.-born White) segments of the U.S. population (Crosnoe et al., 2015). We also need to gauge assimilation among Latino families and determine how these broader stratification systems affect within group heterogeneity. Given the mounting evidence suggesting that poverty, low parental education, and lack of employment are associated with parents' selection of child care and preschool (Coley et al., 2014; Crosnoe et al., 2016) and the fact that Latino families are also more likely to be living in poverty (Macartney, Bishaw, & Fontenot, 2013), it is likely that selection of preschool by Latino families remains confounded with socioeconomic barriers. Thus, continued research is needed to fully understand the underlying reasons why families select preschool, and whether there are differences both within and across groups.

The Accommodations Model for Preschool Selection

The present study is informed by developmental systems theory, which highlights the ways in which multiple systems work together to shape children's development and parents' child care selection (Lerner, 2006). Children's school readiness and their enrollment in preschool are supported by the interplay of multiple institutions (e.g., household, educational, economic, political, cultural). Within the general developmental

systems framework, theories of child care and preschool selection argue that parents'

choice of care is based on a series of accommodations (Meyers & Jordan, 2006).

Balancing between competing demands, preschool selection is not simply about parents'

preferences; rather, they are contextualized actions that also reflect families' needs,

resources, cultural norms, opportunities, and constraints. The accommodations

framework, therefore, integrates central tenets of the developmental systems perspective

(Meyers & Jordan, 2006). Specifically it suggests that to understand why parents select

different types of early education programs for their children, we need to move beyond

the notion that these decisions occur in isolation and explore how such enrollment is

influenced by a set of dynamic and interrelated processes.

Viewing parents' preschool decisions within this context reveals several potential

mechanisms that warrant empirical attention: *family necessity* (e.g., parental

employment), *family resources* (e.g., income and household quality), *human capital*

factors (e.g., expectations for children's education), *child elicitation* (e.g., children's

cognitive skills and behavior), *cultural factors* (e.g., cultural matches between the home

and school), as well as the *supply-side of the community* (e.g., preschool availability). By

leveraging a theoretically grounded framework of preschool selection (Meyers & Jordan,

2006), these models can help provide a more nuanced understanding of why children

attend (or do not attend) preschool during the year before kindergarten.

Parents' decisions regarding preschool is made within the broader context of

family circumstances which, pooled together, reflect *family necessity*. Indeed, it has been

well documented that families' need for child care is rooted within the broader familial

context that includes maternal employment, parents' marital status, and number of children in the household (Meyers & Jordan, 2006). As one example, mothers who work outside of the home, are not partnered with the child's other parent, or have other children are more likely to use formal early education arrangements (Crosnoe, 2007; Fuller et al., 1996; Singer et al., 1998). In contrast, the availability of a relative improves the likelihood that parents will utilize these resources and place their children in an informal care arrangement (Capizzano, Adams, & Ost, 2006).

When examining the preschool utilization behaviors of immigrant and ethnic minority families, theory also points to *cultural factors* that may play an integral role in the search for child care, including English language proficiency, citizenship, and acculturation (Miller, Votruba-Drzal & Coley, 2013). These cultural factors not only influence parents' preferences for preschool and how parents evaluate their opportunities, but they also tap into parents' familiarity with the U.S. educational system (Crosnoe, Ansari, Purtell, & Wu, 2016). When examining the preschool selection of Latino families in particular, another important factor to consider is the cultural matches and mismatches between the home and school systems, which may partially explain why Latino families seek providers who speak their native language (Sandstrom et al., 2012) and, in doing so, narrow the pool of available child care and preschool options.

Aspects of *human capital*, such as parents' values and expectations of themselves and their children, may also play an important role in parents' selection of preschool (Meyers & Jordan, 2006). If parents view preschool as one means of investing in their children's human capital, this might contribute to their selection of a more formal early

education arrangement. In other words, if parents want their children to have a competitive advantage upon school entry, they might seek enrollment in a formal preschool program. Another factor of particular interest is parents' own educational attainment, which plays an integral role in shaping their investments in their children both in terms of time investments, such as engagement in cognitive stimulation (Crosnoe & Kalil, 2010; Magnuson, 2007), as well as monetary investments, such as preschool enrollment (Fuller et al., 1996).

Developmental theory also points to the role of children's own skills and experiences in shaping their parents' decisions regarding preschool (Bell, 1968). This *child elicitation* can take one of two forms: compensatory elicitation or enrichment elicitation. Compensatory elicitation can occur when children exhibit poor school readiness skills or problem behaviors, which prompt parents to seek out assistance to help their children prepare for school. In contrast, enrichment elicitation would occur when children demonstrate strong school readiness skills that may motivate parents to continue to invest in their human capital (Ansari & Crosnoe, 2015a; Crosnoe et al., 2012). Yet, outside of children's gender and age, these other child factors have rarely been examined as determinants of preschool selection. Two recent studies, however, did examine the role of children's skills and behaviors in facilitating parents' preschool decisions, but the results were largely inconclusive (Coley et al., 2014; Crosnoe et al., 2016). Even so, this child-centered mechanism should not be dismissed as these processes can play a stronger role within the Latino population (Ansari & Crosnoe, 2015b).

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Finally, families are nested with broader community contexts, which serve as stratification systems that reflect the *supply-side of the community*. These external contextual forces heavily shape parents' choice of care as they determine preschool accessibility and availability (Meyers & Jordan, 2006). These factors are particularly important for Latino families who often settle in ethnic enclaves of shared language, values, and practices, live in communities with fewer child care options, and have children who attend mono-ethnic schools (Ansari & Winsler, 2014). Latino families often report that few options exist that meet their needs (e.g., proximity, parents' scheduling needs) and this barrier is particularly true for center-based preschool programs, which is why parents turn to alternative arrangements (Sandstrom et al., 2012). That is, under-enrollment in preschool may be partially attributed to the insufficient supply of affordable and high-quality child care (Gordon & Chase-Lansdale, 2001).

The Current Study and Hypotheses

In sum, developmental and economic theory point to several potential mechanisms that may influence families' selection of preschool for their children, several of which have received inadequate attention. By taking a theoretically grounded approach to studying such selection, this dissertation will elucidate the reasons parents choose not to place their children in preschool, or the obstacles they face in doing so, which has been lacking in the extant literature. Moreover, the literature on preschool selection has inadequately addressed how race/ethnicity and nativity may condition these selection processes and whether the factors that drive parents' selection of preschool differ among White, Black, and Latino families, both immigrant and not. Thus, this project is poised to

reveal potential areas of intervention that may be used to tap into the heterogeneity of the Latino population and increase different types of families' preschool participation.

Importantly, each of these aforementioned mechanisms is theoretically meaningful, but varies in how amendable they are to policy intervention. For example, if the barrier to preschool enrollment is the environmental context (or other cultural factors), this can be translated into policies that provide families with a greater number of early care and education options that are cultural matches with the home. If, however, the primary mechanism for preschool selection is parents' perceptions of the role of preschool education—preparing children for kindergarten, or allowing parents to work and manage their other time constraints—this would highlight what types of programs might be a better fit for families (e.g., day care versus preschool). Alternatively, if child elicitation were the primary mechanism for preschool selection, this suggests that closer attention needs to be paid to the role of children in driving home and school connections.

I address the following two research questions:

Research Question 1: What are the processes by which families select into preschool as compared with parental care and other informal arrangements?

Research Question 2: How do these selection processes differ as a function of families' race/ethnicity and nativity?

I hypothesize that each of the aforementioned mechanisms will contribute to children's preschool enrollment in the full sample. Given the exploratory nature of some of the racial/ethnic differences in preschool selection, directional hypotheses were only made for three of the five mechanisms, which prior studies suggest are more salient among the

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Latino population. Primarily, I expect that children would be more likely to enroll in preschool if their parents have greater levels of experience in the U.S. educational system in large part because these families are more likely to know the scripts and written and unwritten rules of U.S. educational institution; therefore, they may be more likely to know the academic value of preschool education and how to find preschool programs that meet their needs. In contrast, I hypothesized that the child elicitation mechanisms would play a stronger role among Latino families than non-Latino families because Latino parents have been found to be more reactive to their children's traits and behaviors than non-Latino populations (Ansari & Crosnoe, 2015b; Chaudry et al., 2011). Finally, I expected that the supply-side of the community would have a more deleterious effect for immigrant Latino families, who may have fewer alternative options due to their desire for cultural matches between the home and school.

METHOD

Data and Sample

For the purposes of this study, I use data from the ECLS-B, which followed a nationally representative cohort of 10,700 children from birth (2001) through kindergarten entry (2006 or 2007; note: per IES/NCES regulations all sample sizes have been rounded to the nearest 50). The initial sample of children excluded those who had died, those who had been adopted after the issuance of the birth certificate, and children who were born to a mother younger than 15 years of age. The ECLS-B used a multistage, stratified, clustered design, and data collection occurred in a variety of forms,

including parent and teacher interviews and direct child assessments (for more on sampling information see, Snow et al., 2009). For this dissertation, I utilize a subsample of 5,850 children who remained in the study through the end of the preschool year and who were identified as Latino—both the children of immigrants and native born mothers—or as U.S.-born Whites or U.S.-born Blacks (see also Crosnoe et al., 2015).

Measures

Below, I describe the focal measures for the mechanisms of preschool selection as well as the focal dependent variable, preschool enrollment.

Race/ethnicity and nativity. NCES identified race/ethnicity on the basis of maternal reports at the nine-month wave of data collection, which was cross classified with mothers' and fathers' immigration status; if either mothers or fathers were born outside of the U.S., then children were classified as coming from an immigrant household.[1] For this study, I used children's race/ethnicity as the primary marker for their families' background, which overlapped with mothers' race/ethnicity for roughly 95% of cases.[2] In the 5% of cases where children's race/ethnicity did not match their mothers, the discrepancy was generally due to the fathers' background. Thus, children's race/ethnicity accurately captured their families' backgrounds. Having established the coding scheme, there were four primary groups of interest. First, to gauge assimilation among Latino families, I focus on the experiences of Latino children from U.S.-born ($n = 750$) and

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[1] Roughly 90% of mothers and fathers were married to partners who were of the same nativity; 5% of fathers who were immigrants were married to a non-immigrant mother, and 5% of mothers who were immigrants were married to a non-immigrant father.

[2] Similar overlap was reported by Gershoff and colleagues (2012) when using data from the Early Childhood Longitudinal Study Kindergarten Cohort of 1998.

foreign-born homes (n = 800). Then, to compare their experiences with the historically

least and most advantaged segments of the population, I consider the experiences of

children from U.S.-born White (n = 3,200) and U.S.-born Black (n = 1,100) homes.

Preschool enrollment. Parents reported whether their child was enrolled in a

preschool (labeled preschool or pre-kindergarten) or Head Start program at the age of 4,

or whether a relative or non-relative cared for them. Similar to prior studies (e.g.,

Bumgarner & Brooks-Gunn, 2014; Crosnoe et al., 2016), my coding scheme of preschool

enrollment gives preference toward any exposure to preschool. Thus, the focal category

was parent-reported preschool enrollment, which included center-based care and Head

Start. Children who were not enrolled in a preschool program but were cared for by a

relative/non-relative—either inside or outside of the home—were coded as receiving

informal care. Finally, children who were not receiving care from a relative or a non-

relative or in a preschool program were categorized as being cared for by a parent.

Family necessity. The first mechanism tapped into family necessity with two sets

of variables that were drawn from the 2-year wave of data collection. First, to capture

family circumstances, indicators of maternal employment (full time, part time,

unemployed), non-standard work schedules (standard = 0 and non-standard = 1), and

enrollment in classes were examined (yes, no). Measures of household structure included

factors indicating whether mothers were single, whether there was a relative living in the

household, and how many children were living in the household. Parents also reported

how important it was that their child care or preschool arrangement took care of sick

children, had flexible hours, was close to home, and was reasonable cost (1 = *not too*

important to 3 = *very important*). These four factors were used to create an indicator of child care and preschool flexibility.

Household quality and resources. The next mechanism, household resources, was captured with four sets of variables. The first two set of factors included mothers' educational histories (less than high school, high school/ GED, some college, bachelor's degree or greater) and their annual household income. Next, parents reported on their receipt of federally-provided benefits that may connect families to child care services, including: Temporary Assistance to Needy Families, the Supplemental Nutrition Assistance Program, Medicaid, the Children's Health Insurance Program. Parents also reported whether they had received job training or housing assistance. These five financial assistance variables (i.e., TANF, SNAP, CHIP, Medicaid, job training) were summed to create an indicator of systemic connections (see also, Crosnoe et al., 2016).

The fourth factor was parenting quality, which was created based on ratings of mothers' parenting behaviors when their children were 24 months of age during the Two Bags Task. The behaviors were scored on a 1 (*very low*) to 7 (*very high*) scale and included seven subscales that tapped into parents' sensitivity, intrusiveness, engagement in cognitive stimulation, positive regard, negative regard, and detachment. Similar to past studies using these scales (Cabrera, Fagan, Wright, & Schadler, 2011), only positive dimensions of parental support were included because there was little variability in the negative dimensions. These positive dimensions of parenting were standardized and then averaged to create an underlying indicator of parenting quality (α = .81).

The fifth and final factor was based on parents' answers to 15 questions regarding the importance of different skills that children need to demonstrate to be ready for school. These questions were scored on a 1 (*not at all important*) to 5 (*essential*) scale and were divided into two subscales to reflect the importance of social-behavioral skills (e.g., "is not disruptive of the class") and academic skills (e.g., "can count to 20 or more"). Both scales demonstrated strong reliability (behavior, $\alpha = .81$; academic, $\alpha = .87$).

Child elicitation. At the age of 2, children's *cognitive* and *motor* skills were directly assessed with the short form of the Bayley Scale of Infant Development ($\alpha = .89$-$.92$; Bayley, 1993). The cognitive domain tapped into children's problem solving, counting, comprehension, and receptive and expressive vocabulary skills, whereas the motor domain measured children's fine and gross motor skills. Children's *negativity* was assessed with a coder rating of videotaped parent-child interactions during the Two Bags Task. Coders rated the degree to which children demonstrated anger, hostility, or dislike toward their parents. Scale scores ranged from 1 to 7, with higher scores indicative of greater negativity. Measures of children's *persistence* were based on interviewer ratings of children's behavior during the Bayley's assessment. The scale ranged from 1 (consistently lacks persistence) to 5 (consistently persistent). Finally, to capture children's physical well-being, I used parents' report of children's physical health from the 2-year wave (1 = *poor*, 5 = *excellent*; see: Crosnoe, Wu, & Bonazzo, 2012). Each of these measures were standardized (and reversed coded, when applicable) and summed to capture children's overall well-being and functioning ($\alpha = .78$). To capture non-linearity

in the associations between children's early functioning and preschool enrollment, this variable was measured in a categorical scheme.[3,4]

Community characteristics. Using methods similar to Gordon and Chase-Lansdale (2001), measures of child care and preschool availability were created using data from the Census, which provides the number of children under 6 living in each zip code as well as the number of child care and preschool centers. Similar to Coley and colleagues (2014), the number of children under 6 was divided by the number of providers; these estimates were logged to correct for non-normality. In doing so, this measure taps into child care and preschool competition, with higher numbers indicative of fewer programs relative to the need. Two additional census variables were included that tap into community factors that may influence the availability and selection of preschool, namely the percentage of employed mothers with children under the age of 6 and the subsidy waitlist within each zip code. Finally, as part of the ECLS-B data collection, parents reported on whether they had a difficult time finding care (have not looked for care, no difficult time finding care, difficult time finding care) and on their household location (region and urbanicity).

Cultural factors. Two sets of variables were included that tapped into parents' acculturation and their expectations of cultural matches between the home and school. I

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[3] Given concerns regarding statistical power and lost variance when categorizing continuous and quasi-continuous variables, models were re-estimated with the continuous versions of the categorical predictors and results were both similar to those presented below. However, considering that some of the variables exhibited a non-linear association with preschool selection, the categorical approach was used in the final analyses.

[4] Models were estimated with each individual predictor included in the model and results revealed much the same pattern as when the variables were combined.

used parents' English proficiency and citizenship status as primary indicators of acculturation. For English proficiency, mothers were asked to report how well they spoke English using a 4-point Likert scale (1 = *not very well at all* to 4 = *very well*). Because only non-English speaking parents were asked these questions, all English speakers were coded as fully proficient (see, Cabrera et al., 2006). Second, using a 3-point Likert scale (1 = *not too important* to 3 = *very important*), parents reported how important cultural consistency was when they searched for care for their children, namely the importance of caregivers who: spoke their native language, spoke English, were of the same race/ethnicity, and/or shared the same beliefs for child rearing. These variables were averaged to create a composite of cultural consistency across the home and school. Finally, using data from the Census, I considered the contribution of community-level language use. Specifically, I examined the proportion of families within each community who were considered to be: (1) English speakers only; (2) Spanish and English fluent; and (3) linguistically isolated. The Census Bureau defines a linguistic isolation as households in which no member over 14 years of age speaks only English or speaks a non-English language and speaks English very well (Siegel, Martin, & Bruno, 2001).

 Covariates. In addition to the aforementioned factors, several additional variables were included as covariates, namely: children's gender, children's age during preschool, mothers' age at birth, children's age of first care, and their child care arrangement at age 2 (center-based care, informal care, or parental care).

Analysis Plan

All analyses were estimated using the Stata program (Stata Corp, 2009). I employed a sequential modeling strategy. I began by estimating a logistic regression model to examine the extent to which the various potential selection factors affected families' selection into preschool in the full sample as compared with parental care and other informal care arrangements (controlling for race/ethnicity). Then, I re-estimated these same models separately for White, Black, and immigrant and non-immigrant Latino families. To determine whether race/ethnicity conditioned the observed associations, post-hoc coefficient comparisons to formally assess for moderation across racial/ethnic group membership (Clogg et al., 1995; Paternoster et al., 1998). All models included (a) cluster and stratification variables to adjust the standard errors as function of shared variance in the dependent variables, and (b) the longitudinal weight, which ensured that the sample was representative of the nation's children while also adjusting for cross-wave attrition. To address issues of missing data, 20 datasets were imputed using the chained equations method in the Stata program.

RESULTS

Estimates from the ECLS-B revealed that immigrant Latino families across the U.S. were under-enrolled in any form of formal preschool program by 14-16% as compared with U.S.-born Black and White families, and by 7% as compared with U.S.-born Latino families (see Table 1). In contrast, children of immigrant Latino families were more likely to remain at home with their mother at age 4 (30%) than were children

from non-Latino White (18%), non-Latino-Black (17%), and U.S.-born Latino families (20%). Smaller, but still statistically significant, group differences also existed when considering children's rates of enrollment in informal care, with children from U.S.-born Latino families most likely to attend these informal care arrangements (17% vs. 10-14%).

Selection of preschool education. Having established the bivariate differences in children's preschool enrollment, I proceeded to the next objective, which was to predict preschool enrollment in the full ECLS-B sample while controlling for race/ethnicity and nativity. All multivariate findings are discussed in terms of odds ratios (unstandardized coefficients and standard errors are provided in Tables 2 and 3). Table 2 provides these estimates for preschool enrollment as compared with parental care, whereas Table 3 provides estimates for preschool enrollment as compared with other informal care arrangements. To interpret an odds ratio the estimates are multiplied by 100 to give the percent change in preschool enrollment associated with a one-unit change in the predictor. The majority of the focal predictors were categorized into dummy variables and so interpretation of a one-unit change in a predictor is straightforward, as is the comparison of effect sizes between predictors. To ease the interpretation of the remaining continuous and quasi-continuous predictors, these variables have been standardized; therefore, the odds ratio for these variables can be interpreted in terms of a standard deviation change in the predictor rather than a one-unit change.

As can be seen in the Overall column of Tables 2 and 3, there were fewer differences in the rates of preschool participation across racial/ethnic group membership when accounting for the other selection factors; the sole exception was that U.S.-born

Latinos were marginally more likely to participate in informal care (but not parental care) as compared with U.S.-born White families. Thus, these results across the bivariate and multivariate models indicate that the selection of preschool by native and immigrant Latino families remains confounded with other socio-economic barriers.

Having established the multivariate disparities in preschool enrollment, I proceed to a discussion of the selection models. As compared with parental care, preschool enrollment was in part a function of necessity; parents who were employed either part- or full-time were 46 and 92% more likely to enroll their children in preschool than unemployed parents, and mothers who were enrolled in classes were 67% more likely to enroll their children in preschool than keep them at home. In contrast, when there was a father in the household, or when children had a greater number of siblings under 18, they were 34 and 21% less likely to attend a formal preschool program at age 4 (versus parental care). Unlike the comparison to parental care, family necessity did not play a consistent role in parents' preschool selection when compared with other informal care arrangements (see Table 3). There were two exceptions, however. Parents who needed greater child care flexibility were 21% less likely to select into a preschool program and children who had a greater number of siblings were 20% less likely to attend preschool. Instead, these parents were more likely to enroll their children in other informal child care arrangements when their children were 4 years of age.

Preschool enrollment was also a function of household resources, with less educated and less affluent families exhibiting a lower likelihood of preschool participation as compared with parental care. While household income was not a

consistent predictor of preschool selection when parents were deciding between preschool and other informal care arrangements, parents' educational attainment was linked with increased odds of preschool enrollment. Parenting quality (i.e., parents' sensitivity, engagement in cognitive stimulation, positive regard) and systemic connections, net of household income and education, did not have implications for children's preschool enrollment (versus either parental care or informal care).

Although parents' own behaviors did not facilitate children's rates of preschool participation, their beliefs about children's development and children's own skills and behaviors did have implications for preschool enrollment. As one example, children who exhibited the most optimal functioning were 27% less likely to be enrolled in preschool than parental care. Relatedly, parents who valued their children's academic readiness for kindergarten were 28 and 38% more likely to select into a formal preschool program (versus parental care and informal care), whereas parents who placed a stronger emphasis on children's social behavior, were 24 and 21% less likely to enroll their children in preschool as compared with parental care and other informal arrangements, respectively.[5]

A number of community factors were also linked with preschool selection. Not surprisingly, when parents had a hard time finding care, they were 77 and 65% less likely to enroll their children in preschool and to keep them at home or with a relative. There were also clear regional differences in parents' selection of preschool; parents who lived in the Midwest, South, and West, were generally less likely to enroll their children in

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[5] There was no interaction between parents' valuation of children's academic and social-behavior readiness for kindergarten in the prediction of preschool enrollment as compared with parental care or informal care.

preschool as compared with parents in the Northeast. Finally, outside of English

proficiency, there was limited evidence to suggest that cultural factors facilitated

preschool selection in the full sample, which is not entirely unexpected given that many

these cultural factors were somewhat specific to the Latino and immigrant populations.

Selection of preschool: moderation by race/ethnicity. Having established the

general patterns of selection into preschool in the full sample, I now proceed to assessing

the between group differences, with a focus on differences between immigrant and

native-born Latino families. Again, to determine whether racial/ethnic group membership

conditioned the observed associations, post-hoc tests were used to compare coefficients

across groups. I only discuss findings that were significantly different *within* the Latino

population, but the significant differences that did emerge among Latino families and

U.S.-born Black and White families are presented in Tables 2 and 3.[6]

Results from these moderation analyses revealed that there were not many

differences within the Latino population with respect to the implications of family

necessity for preschool selection. One of the two key differences that emerged was that

the negative effect of having more siblings in the household on preschool selection was

only true for U.S.-, and not foreign-born, Latino families; specifically, Latino children

from U.S.-born homes who had a greater number of siblings were 42 and 41% less likely

to attend preschool than parental care and informal care, respectively. The second key

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[6] When there is no evidence for moderation, then the estimates from the overall column can be
generalized to all populations; when there is evidence for moderation, then the estimates from the
subgroup models should be interpreted.

difference that emerged within the Latino population was that having a father in the household only reduced foreign-born families' likelihood of attending preschool.

In terms of household resources, systemic connections (e.g., receipt of TANF, Food Stamps, Medicaid) played an important role in connecting U.S.-born Latino parents' to preschool programs: U.S.-born Latino families who had a greater number of systemic connections were 55% more likely to enroll their children in preschool (versus other informal arrangements), which was not the case for immigrant families. Additionally, although parenting quality was not associated with preschool enrollment in the full sample, children from U.S.-born Latino homes were 225% more likely to attend a formal preschool program (versus parental care) if they lived in a lower quality household, which was also *not* the case for Latino children from immigrant homes.

There were also consistent differences for child elicitation and parents' beliefs about children's academic and social-behavioral development. In particular, not only did children's own skills play an important role in the selection behaviors of Latino families, but it did so in somewhat orthogonal ways. Specifically, Latino children who were struggling in areas of early learning at age 2 were 67% less likely to be enrolled in preschool two years later if their mothers were born in the U.S., whereas for the children of foreign-born mothers, those who were struggling at age 2 were 183% more likely to be enrolled in preschool at age 4 than remain at home. At the same time, however, Latino children of U.S.-born families who were highly functioning were 68% less likely to attend preschool as compared with parental care, which was not the case for the children from immigrant households. Finally, parents' valuation of their children's academic

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(versus parental care) and social-behavioral (versus parental care and informal care)

development also influenced preschool selection, but only among U.S.-born Latinos.

When taken together, these results indicate that U.S.-born Latino families opted to keep

their children at home when they exhibited relatively low or high levels of functioning

(i.e., a non-linear association) and that preschool was viewed as a means of preparing

children academically for school, whereas immigrant Latino families viewed preschool in

a compensatory manner.

There were no consistent differences with respect to the supply side of the

community, but there were a number of differences when considering the role of culture

as a driver of preschool selection. For example, immigrant Latino families who were

more fluent in the English language were *more* likely to select into preschool (versus

parent care), whereas U.S.-born Latino families who were more fluent in English were

less likely to enroll their children in preschool (versus other informal care). As another

example, and contrary to some of the existing literature (e.g., Zambrana & Morant,

2009), Latino parents who valued cultural consistency across the home and school

systems were 35% *more* likely to select a formal preschool program (versus parent care)

for their children if they were born in Latin America, but opposite patterns emerged for

U.S.-born Latino families (30% *less* likely). However, when compared with other

informal care arrangements, parents' valuation of cultural consistency—across both

groups of Latino families—was associated with a reduced likelihood of preschool

participation. Finally, although living in linguistically isolated communities did not

influence families' decisions regarding preschool enrollment, immigrant families who

lived in communities that had greater support for *both* the Spanish and English language were 58% more likely to enroll their children in preschool (versus parental care), but parallel processes were not at play for U.S.-born families.[7]

In all, these moderation analyses reveal that there was considerable heterogeneity in the ways in which immigrant and U.S.-born Latino families interacted with the preschool market during the year before kindergarten. These differences generally cut across children's early functioning—both with respect to their actual skills and behaviors, and their parents' valuation of their academic and social-behavioral skills—and the domains of culture and household resources.

DISCUSSION

Early childhood programs hold great promise in preparing children for school and reducing the socio-economic disparities in their long-term school success (Duncan & Magnuson, 2013). With the mounting evidence that preschool education can make a difference in children's educational prospects, there is a growing need to understand *why* certain groups of children are less likely to participate than others. The first aim of this dissertation was intended to address this "why" question and builds on the existing literature on preschool selection (e.g., Coley et al., 2014; Crosnoe et al., 2016; Fuller et al., 1996; Ha et al., 2013) by applying the accommodations framework (Meyers & Jordan, 2006) to nationally representative data from the ECLS-B in order to understand

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[7] There were no significant interactions between immigrant Latino families' English language proficiency and linguistic isolation at the community level.

potential racial/ethnic differences in preschool enrollment. Taken together, the results of this work underscore the similarities and differences that exist in the preschool selection behaviors of different groups of children and families in the U.S., while also highlighting the heterogeneity that exists *within* the Latino population. The results of this study have three take home messages that are discussed below.

Similar to other national estimates (Child Trends, 2012), data from the ECLS-B revealed that Latino children were under-enrolled in preschool education at age 4. Specifically, approximately 56% of Latino children from foreign-born households were enrolled in a preschool program, which was lower than U.S.-born Latino children (63%) and U.S.-born Black (70%) and White children (72%). However, these disparities in preschool enrollment were largely attributed to other factors; when accounting for the various selection mechanisms, there were no longer any racial/ethnic differences in children's preschool enrollment. In other words, Latino children—especially those from foreign-born homes—appeared to be under-enrolled in preschool education not because of cultural differences per se but instead, because of an accumulation of inequality (socio-economic factors, parents' limited English fluency, and parents' difficulty in finding child care options that met their needs). The sole exception was that Latino children from U.S.-born homes were marginally more likely to attend informal care arrangements as compared with preschool, even when accounting for selection.

Even though these disparities in enrollment are largely attenuated after accounting for the selection mechanisms, the bivariate differences are still a cause for concern. In other words, although under-enrollment in preschool is a function of racial/ethnic group

membership, it is confounded by other factors; to ignore these bivariate differences, however, is to ignore the accumulation of disadvantages faced by these populations. In reality, these findings underscore the need for greater equity in preschool education, which in turn can potentially reduce inequality in children's educational prospects. Inequality is multifaceted and is a reality faced by many Latino families throughout the life course (Crosnoe, 2005, 2007; Fuller et al., 2009; Reardon & Galindo, 2009) and reflects differential opportunities and resources available to them. Given such evidence, greater effort needs to be made toward tailoring policy initiatives that can reduce barriers towards preschool enrollment for Latino families.

The second key message is that preschool enrollment was multiply determined. It was not driven by any one factor or mechanism; rather, it was a shaped by a number of factors that cut across various levels of family and community context that drove parents' decisions for their children's preschool education. For example, children were more likely to attend preschool when their parents had an easier time finding a preschool program (accessibility), had a greater need for preschool (necessity), valued their children's academic readiness for school, and had greater socio-economic resources (household resources). At the same time, parents across the country preferred to enroll their children in other informal child care arrangements when they valued their children's social-behavioral development, needed greater child care flexibility, and when their children exhibited high levels of functioning. Interestingly, the social-behavioral patterns map onto some of the existing literature that indicates that children who attend early childhood programs for longer hours exhibit less optimal behavioral development

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(Belsky et al., 2007; Votruba-Drzal et al., 2004). Thus, it might be that parents are concerned with the potential harmful effects of preschool for their children's social behavior. Alternatively, it could be that parents believe that they shape their children's social-behavior, while preschool programs are meant for developing children's academic competencies. Regardless of the underlying reason, these results indicate that future researchers need to pay closer attention to what parents expect from early childhood programs, and how these factors shape their decisions for preschool.

The final take home message is that there were fewer differences in preschool selection *across* racial/ethnic group membership, but there was more consistent evidence for heterogeneity when looking *within* the Latino population. For example, when looking within the Latino population there was evidence for child elicitation, with the ways in which Latino parents reacted to their children's skills varying as a function of their nativity. U.S.-born Latino families were more likely to keep their children at home when they exhibited either low or high levels of functioning and to view preschool as a means of preparing children academically for kindergarten, whereas immigrant Latino families viewed preschool in a compensatory manner. These findings resonate with some of the recent findings that these child-driven effects may be more pronounced within the Latino population (Ansari & Crosnoe, 2015b). These results add to these prior studies by providing a more nuanced understanding of these processes and underscoring the within group differences in these transactions.

These differences within the Latino population also existed within the domain of culture. Interestingly, when immigrant families were immersed in communities with high

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use of *both* Spanish and English, they were more likely to select into preschool,

suggesting that the community environments surrounding families do play important

roles in facilitating children's preschool participation. These community factors that

represent high use of Spanish and English could potentially reflect the opportunities and

resources available to families as they adapt to the U.S. culture (Glick, Walker, Luz,

2012). Although there were no community differences when examining the experiences

of native-born Latino families, there was ample evidence to suggest that native-born

families who were more accustomed to the U.S. culture (e.g., English language

proficiency) were *less* likely to enroll their children in preschool and had a greater desire

for matches between the home and school systems.

Why do we see such disparities across immigrant and native-born families? One

possible explanation is that second generation immigrants want to hold on to their

ancestry and cultural values. Another potential explanation might stem from the type of

communities that these families are residing in (e.g., ethnic enclaves, new immigrant

destinations). Nonetheless, regardless of why these differences emerge across immigrant

and native-born families, these findings indicate that some of the preconceived notions

regarding the under-enrollment of Latino families and the roles of familial and cultural

values (e.g., Fuller & Garcia Coll, 2010; Zambrana & Morant, 2009) seem to be more

specific to U.S.-born Latino families as compared with Latino children from foreign-born

homes and to pertain more to the selection of preschool versus other informal

arrangements rather than parental care (i.e., no out of home care).

When taken together, these moderation findings indicate that the motivations for preschool enrollment vary systematically within the Latino population, as do the barriers faced by these families. If the intent is to boost the preschool enrollment of Latino children across the country, then different policies may need to be tailored to have an effect on the preschool utilization behaviors of different sub-segments of the Latino population. As one example, for U.S.-born Latino families, closer attention must be paid to the cultural matches and mismatches between the home and school systems, whereas for foreign-born Latino families, providing parents with more information about the potential academic benefits of preschool may lead to increased participation.

Limitations and Conclusions. As with any study, there are important limitations that need to be taken into consideration when interpreting the results reported herein. The primary limitation of this current work is a reflection of sample size. Although the ECLS-B provided enough statistical power to look at the experiences of families across racial/ethnic group membership, and tease apart the heterogeneity that exists within the Latino population, there was not always sufficient cell coverage to examine other sources of heterogeneity. Thus, continued research is necessary to help unpack the other sources of diversity that exists within the Latino population, especially among non-Mexican origin Latinos (e.g., sub-group heritage, citizenship, and legal status), for which there was not sufficient sample size to consider. Relatedly, a relatively small sample of Latino families meant that I could not disentangle differences across different types of formal preschool programs (e.g., Head Start, public versus private). A caveat to this limitation is that prior studies of preschool selection within low-income samples show that there are

fewer differences within "formal" early childhood programs as compared with the formal and informal care divide (Crosnoe et al., 2016).

Next, although these analyses provided the opportunity to examine these selection processes at the national level, applying the accommodations model to understand such selection across different communities in the U.S. is still necessary. Such inquiry is needed because the ways in which parents engage with the preschool market are likely to be different in communities such as Miami, where there is long-standing history of socio-linguistic support for the Spanish language, than they would be in communities such as North Carolina, which has an emerging concentration of the Latino population. Finally, although this study applied a theoretical model to understand parents' selection behaviors, these findings do not represent cause and effect. It should be noted, however, that predictors were drawn from two years *prior* to preschool entry whenever possible. Thus, the temporal ordering of the selection mechanisms (the predictor) and children's preschool enrollment (the outcome) reduces concerns of reverse causality.

With these limitations in mind, the results of this study contributes to our understanding of the similarities and differences that exist in the preschool selection behaviors of different groups of children and families across the country, while also highlighting important differences that exist *within* the Latino population (cultural and community factors, child elicitation, and parents' beliefs about school readiness). To increase the preschool enrollment of Latino families, policy makers and practitioners may need to pay special attention to differences that exist within the Latino population.

Table 1.
Weighted sample descriptives for the ECLS-B, stratified by race/ethnicity.

Variable	Overall	U.S.-born White	U.S.-born Black	U.S.-born Latino	Foreign-born Latino
Child race/ethnicity					
U.S.-born White	0.58	1.00	--	--	--
U.S.-born Black	0.14	--	1.00	--	--
U.S-born Latino	0.12	--	--	1.00	--
Foreign-born Latino	0.16	--	--	--	1.00
Child care type at age 4					
Any preschool	0.68	0.72 [a]	0.70 [a]	0.63 [b]	0.56 [c]
Informal care	0.12	0.10 [a]	0.13 [b]	0.17 [c]	0.14 [b,c]
Parental care	0.20	0.18 [a]	0.17 [a]	0.20 [a]	0.30 [b]
Family necessity					
Mom unemployed	0.45	0.42 [a]	0.42 [a]	0.44 [a]	0.59 [b]
Mom employed part-time	0.21	0.25 [a]	0.17 [b]	0.16 [b]	0.12 [b]
Mom employed full-time	0.35	0.34 [a]	0.42 [b]	0.40 [b]	0.28 [c]
Mom non-standard work schedule	0.14	0.15 [a]	0.17 [a]	0.12 [b]	0.09 [b]
Mom enrolled in classes	0.12	0.10 [a]	0.23 [b]	0.15 [c]	0.10 [a]
Father in household	0.79	0.88 [a]	0.39 [b]	0.70 [c]	0.88 [a]
Relative in household	0.20	0.13 [a]	0.30 [b,c]	0.28 [c]	0.33 [b]
Number of children under 18	2.23 (1.16)	2.13 (1.06) [a]	2.45 (1.29) [b]	2.23 (1.25) [b]	2.38 (1.25) [c]
Child care and preschool flexibility	9.86 (1.96)	9.31 (1.98) [a]	10.67 (1.58) [b]	10.26 (1.80) [c]	10.82 (1.58) [b]
Home quality and resources					
High school diploma/GED	0.20	0.10 [a]	0.26 [b]	0.26 [b]	0.43 [c]
Some college	0.29	0.26 [a]	0.36 [b]	0.32 [b]	0.32 [b]
Bachelor's degree	0.28	0.30 [a]	0.30 [a]	0.31 [a]	0.17 [b]
Some graduate school	0.24	0.34 [a]	0.08 [b]	0.12 [b]	0.08 [b]

Table 1 continued on next page

Table 1 (continued)

Variable	Overall	U.S.-born White	U.S.-born Black	U.S.-born Latino	Foreign-born Latino
Annual income: $0-$20,000 (G1)	0.25	0.15 [a]	0.51 [b]	0.30 [c]	0.36 [d]
Annual income: $20,001-$40,000 (G2)	0.28	0.22 [a]	0.31 [b]	0.33 [b]	0.45 [c]
Annual income: $40,001-$100,000 (G3)	0.25	0.31 [a]	0.13 [b]	0.25 [c]	0.13 [b]
Annual income: $100,001+ (G4)	0.21	0.31 [a]	0.06 [b]	0.12 [c]	0.06 [b]
Systemic connections	1.13 (1.34)	0.77 (1.16) [a]	2.28 (1.53) [b]	1.47 (1.43) [c]	1.18 (1.00) [d]
Parenting quality low (G1)	0.20	0.12 [a]	0.33 [b]	0.19 [c]	0.40 [d]
Parenting quality average (G2-G4)	0.58	0.60 [a]	0.58 [a]	0.63 [a]	0.49 [b]
Parenting quality high (G5)	0.22	0.29 [a]	0.09 [b]	0.18 [c]	0.11 [d]
Importance of academics for K	4.01 (0.57)	3.94 (0.57) [a]	4.16 (0.56) [b]	4.07 (0.57) [c]	4.08 (0.54) [c]
Importance of behavior for K	4.14 (0.47)	4.10 (0.47) [a]	4.22 (0.46) [b]	4.18 (0.47) [b]	4.17 (0.46) [b]
Child factors					
Child functioning low (G1)	0.17	0.13 [a]	0.22 [b,c]	0.20 [b]	0.26 [c]
Child functioning average (G2-G4)	0.60	0.58 [a]	0.60 [a,b]	0.61 [a,b]	0.63 [b]
Child functioning high (G5)	0.23	0.29 [a]	0.19 [b]	0.19 [b]	0.10 [c]
Supply side of the community					
Child care and preschool competition	-0.01 (1.08)	0.04 (1.06) [a]	0.10 (1.08) [a]	-0.12 (1.09) [b]	-0.17 (1.09) [b]
Proportion of working moms	0.57 (0.10)	0.59 (0.10) [a]	0.57 (0.09) [b]	0.54 (0.10) [c]	0.54 (0.10) [c]
Subsidy waitlist	0.63 (0.48)	0.55 (0.50) [a]	0.69 (0.46) [b]	0.74 (0.44) [b,c]	0.77 (0.42) [c]
Difficulty time finding care	0.26	0.25 [a]	0.24 [a]	0.30 [b]	0.26 [a,b]
No difficult time finding care	0.60	0.64 [a]	0.66 [a]	0.53 [b]	0.48 [b]
Have not looked for care	0.14	0.12 [a]	0.10 [a]	0.17 [b]	0.26 [c]
Northeast	0.16	0.17 [a]	0.16 [a]	0.16 [a]	0.14 [a]
Midwest	0.23	0.29 [a]	0.21 [b]	0.11 [c]	0.11 [c]
South	0.37	0.35 [a]	0.56 [b]	0.29 [c]	0.32 [a,c]
West	0.24	0.18 [a]	0.07 [b]	0.44 [c]	0.43 [c]
Urban	0.84	0.76 [a]	0.91 [b]	0.95 [b,c]	0.97 [c]

Table 1 continued on next page

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Table 1 (continued)

Variable	Overall	U.S.-born White	U.S.-born Black	U.S.-born Latino	Foreign-born Latino
Cultural factors					
Mother citizenship status	0.88	1.00 [a]	1.00 [a]	1.00 [a]	0.27 [b]
Mother English proficiency	3.73 (0.77)	4.00 (0.00) [a]	4.00 (0.00) [a]	3.91 (0.40) [b]	2.42 (1.20) [c]
Spanish speaking community	0.05 (0.08)	0.02 (0.03) [a]	0.04 (0.05) [b]	0.09 (0.09) [c]	0.14 (0.11) [d]
Bilingual community	0.17 (0.14)	0.11 (0.09) [a]	0.13 (0.10) [b]	0.27 (0.16) [c]	0.30 (0.15) [d]
English speaking community	0.78 (0.20)	0.86 (0.11) [a]	0.83 (0.15) [b]	0.63 (0.24) [c]	0.56 (0.24) [d]
Preschool cultural consistency	6.58 (1.19)	6.64 (1.01) [a]	6.65 (1.13) [a]	6.22 (1.25) [b]	6.57 (1.66) [a]
Covariates					
Mother age	28.12 (6.33)	29.25 (6.20) [a]	25.35 (6.00) [b]	26.28 (6.46) [c]	27.85 (5.91) [d]
Child age of first care (months)	14.08 (16.37)	15.00 (16.86) [a]	8.03 (10.91) [b]	11.41 (14.87) [c]	17.96 (17.86) [d]
No non-parental care at age 2	0.51	0.51 [a]	0.36 [b]	0.48 [a]	0.63 [c]
Other non-parental care at age 2	0.34	0.32 [a]	0.38 [b]	0.38 [b]	0.30 [a]
Center-based care at age 2	0.16	0.16 [a]	0.26 [b]	0.14 [a]	0.07 [c]
Child is female	0.49	0.49 [a]	0.47 [a]	0.49 [a]	0.48 [a]
Child age at preschool (months)	52.46 (4.06)	52.17 (3.91) [a]	52.16 (4.19) [a]	53.23 (4.13) [b]	53.17 (4.26) [b]
Sample size	5,850	3,250	1,100	750	750

Notes. Different superscripts within each row indicate significant differences across groups.

Table 2. *Predictors of preschool enrollment as compared with parental care.*

	Likelihood of being enrolled in preschool versus parental care										Moderation Evidence
	Overall		U.S.-born White		U.S.-born Black		U.S.-born Latino		Foreign-born Latino		
Variable	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Race/ethnicity (vs. U.S.-born White)											
U.S.-born Black	0.09 (0.19)	1.09	--	--	--	--	--	--	--	--	--
U.S-born Latina	0.05 (0.24)	1.05	--	--	--	--	--	--	--	--	--
Immigrant Latina	0.41 (0.35)	1.51	--	--	--	--	--	--	--	--	--
Family necessity											
Mom employed part-time	0.38 * (0.19)	1.46	0.14 (0.27)	1.15	0.71 (0.45)	2.03	0.68 (0.54)	1.97	0.87 (0.63)	2.39	NO
Mom employed full-time	0.65 *** (0.19)	1.92	0.65 * (0.31)	1.92	0.54 (0.57)	1.72	0.51 (0.57)	1.67	0.92 (0.60)	2.51	NO
Mom non-standard work schedule	-0.26 (0.22)	0.77	0.16 [a] (0.26)	1.17	-0.36 [a, b] (0.41)	0.70	-1.47 * [b] (0.61)	0.23	-0.59 [a, b] (0.66)	0.55	YES
Mom enrolled in classes	0.51 ** (0.18)	1.67	0.71 * (0.28)	2.03	0.46 (0.37)	1.58	0.17 (0.54)	1.19	0.38 (0.55)	1.46	NO
Father in household	-0.41 * (0.19)	0.66	-0.58 † [a] (0.32)	0.56	-0.85 † [a] (0.45)	0.43	0.42 [b] (0.45)	1.52	-1.15 † [a] (0.69)	0.32	YES
Relative in household	0.31 † (0.18)	1.36	0.08 (0.32)	1.08	0.08 (0.38)	1.08	0.82 (0.51)	2.27	0.59 (0.38)	1.80	NO
Number of siblings under 18	-0.23 *** (0.06)	0.79	-0.22 * [a] (0.09)	0.80	-0.37 * [a,b] (0.17)	0.69	-0.54 *** [b] (0.16)	0.58	-0.10 [a] (0.13)	0.90	YES
Child care and preschool flexibility	-0.10 (0.07)	0.90	-0.11 (0.09)	0.90	-0.27 (0.18)	0.76	0.12 (0.18)	1.13	-0.11 (0.22)	0.90	NO
Home quality and resources											
High school diploma/GED	-0.99 *** (-0.27)	0.37	-1.11 ** (0.35)	0.33	-0.33 (0.74)	0.72	-0.64 (0.80)	0.53	-0.01 (0.71)	0.99	NO
Some college	-0.70 *** (0.20)	0.50	-0.94 *** (0.24)	0.39	-0.27 (0.63)	0.76	0.27 (0.69)	1.31	0.36 (0.71)	1.43	NO
Bachelor's degree	-0.48** (0.18)	0.62	-0.70 *** (0.22)	0.50	-0.16 (0.66)	0.85	0.42 (0.64)	1.52	0.13 (0.65)	1.14	NO
Annual income: $0-$20,000 (G1)	-0.63 * (0.27)	0.53	-0.75 † (0.39)	0.47	0.01 (1.10)	1.01	-1.48† (0.87)	0.23	-0.18 (1.09)	0.84	NO

Table 2 continued on next page.

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Table 2 (continued)

| | Likelihood of being enrolled in preschool versus parental care | | | | | | | | | | Moderation Evidence |
| | Overall | | U.S.-born White | | U.S-born Black | | U.S-born Latino | | Foreign-born Latino | | |
	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Annual income: $20,001-$40,000 (G2)	-0.72 ** (0.23)	0.49	-0.87** (0.32)	0.39	-0.10 (1.13)	0.90	-1.13 (0.72)	0.32	-0.09 (1.03)	0.91	NO
Annual income: $40,001-$100,000 (G3)	-0.67 *** (0.20)	0.51	-0.69 ** (0.25)	0.50	0.21 (0.99)	1.23	-0.92 (0.65)	0.40	-0.40 (0.93)	0.67	NO
Systemic connections	-0.08 (0.08)	0.92	0.04 [a] (0.13)	1.04	-0.32 † [b] (0.16)	0.73	-0.12 [a,b] (0.21)	0.89	0.26 [a] (0.26)	1.30	YES
Parenting quality low (G1)	0.23 (0.18)	1.26	0.17 [a,b] (0.33)	1.19	0.40 [a,b] (0.39)	1.49	1.18 * [a] (0.52)	2.25	-0.31 [b] (0.35)	0.73	YES
Parenting quality high (G5)	-0.06 (0.16)	0.94	-0.09 (0.20)	0.91	-0.68 (0.60)	0.50	0.31 (0.50)	1.36	0.49 (0.53)	1.63	NO
Importance of academic for K	0.25 ** (0.08)	1.28	0.13 [a] (0.12)	1.14	0.50 * [a,b] (0.22)	1.65	0.89 ** [b] (0.29)	2.44	-0.18 [a] (0.22)	0.84	YES
Importance of behavior for K	-0.28 ** (0.09)	0.76	-0.21† [a] (0.12)	0.81	-0.38 [a,b] (0.24)	0.68	-0.84 ** [b] (0.30)	0.43	0.09 [a] (0.21)	1.09	YES
Child factors											
Child functioning low (G1)	0.30 (0.18)	1.35	0.61* [a, c] (0.29)	1.84	-0.03 [a] (0.37)	0.97	-1.11 ** [b] (0.42)	0.33	1.04 ** [b] (0.33)	2.83	YES
Child functioning high (G5)	-0.32 * (0.16)	0.73	-0.24 [a] (0.23)	0.79	-0.10 [a,b] (0.49)	0.90	-1.05 * [b] (0.45)	0.35	-0.39 [a] (0.50)	0.68	YES
Supply side of the community											
Child care and preschool competition	0.11 (0.07)	1.12	0.27* [a] (0.11)	1.31	-0.34 * [b] (0.17)	0.71	-0.02 [b] (0.15)	0.98	0.22 [a,b] (0.17)	1.25	YES
Proportion of working moms	-0.08 (0.07)	0.92	-0.14 (0.10)	0.87	0.03 (0.22)	1.03	-0.34 (0.22)	0.71	0.08 (0.20)	1.08	NO
Subsidy waitlist	0.10 (0.08)	1.10	0.15 (0.12)	1.16	0.06 (0.17)	1.06	-0.30 (0.22)	0.74	0.31 (0.21)	1.36	NO
Difficulty finding care	-1.48 *** (0.13)	0.23	-1.45 *** [a] (0.18)	0.23	-1.76 *** [a,b] (0.27)	0.17	-1.43 *** [a,b] (0.44)	0.23	-2.14 *** [b] (0.34)	0.12	YES
Midwest	-0.35 (0.26)	0.70	-0.01 [a] (0.27)	0.99	-1.78 * [b] (0.88)	0.17	-0.84 [a,b] (0.73)	0.43	-0.83 [a,b] (0.76)	0.44	YES
South	-0.47 * (0.22)	0.63	-0.33 (0.26)	0.72	-1.34 † (0.81)	0.26	-0.84 (0.55)	0.43	-1.58 * (0.66)	0.21	NO
West	-0.69 ** (0.23)	0.50	-0.16 [a] (0.27)	0.85	-2.08 * [b] (0.88)	0.12	-1.53 *** [b] (0.47)	0.22	-1.91 *** [b] (0.56)	0.15	YES

Table 2 continued on next page

Table 2 continued

	Likelihood of being enrolled in preschool versus parental care										Moderation Evidence
	Overall		U.S.-born White		U.S-born Black		U.S-born Latino		Foreign-born Latino		
Variable	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Urban	0.17 (0.15)	1.19	0.06 [a] (0.19)	1.06	-0.19 [a] (0.51)	0.83	1.15 [a] (0.91)	3.16	-1.63 * [b] (0.67)	0.20	YES
Cultural factors											
Mother citizenship status	0.31 (0.40)	1.36	---	---	---	---	---	---	0.24 (0.40)	1.27	N/A
Mother English proficiency	0.22 * (0.11)	1.25	---	---	---	---	0.03 [a] (0.36)	1.03	0.41 *** [b] (0.13)	1.51	YES
Spanish speaking community	0.05 (0.10)	1.05	-0.15 (0.34)	0.86	0.47 (0.46)	1.60	0.33 (0.30)	1.39	-0.11 (0.13)	0.90	NO
Bilingual community	0.14 (0.11)	1.15	0.19 [a,b] (0.24)	1.21	-0.02 [a,b] (0.41)	0.98	-0.23 [a] (0.26)	0.79	0.46 * [b] (0.19)	1.58	YES
Preschool cultural consistency	0.04 (0.06)	1.04	-0.03 [a] (0.11)	0.97	0.10 [a,b] (0.15)	1.10	-0.35 † [a] (0.19)	0.70	0.30 ** [b] (0.10)	1.35	YES
Covariates											
Mother age	0.01 (0.09)	1.01	0.19 * [a] (0.09)	1.21	0.06 [a,b] (0.18)	1.06	-0.32 [b] (0.23)	0.73	-0.09 [a,b] (0.19)	0.91	YES
Child age of first care	0.60 *** (0.08)	1.82	0.56 *** [a] (0.11)	1.75	0.34 [a] (0.22)	1.40	0.74 *** [a,b] (0.23)	2.10	0.91 *** [b] (0.16)	2.48	YES
Other non-parental care age 2	0.77 *** (0.18)	2.16	0.58 * (0.24)	1.79	0.54 (0.35)	1.72	1.03 * (0.47)	2.80	0.87 (0.58)	2.39	NO
Center-based care at age 2	0.60 *** (0.08)	1.82	0.50 † [a] (0.28)	1.65	0.78 † [a,b] (0.47)	2.18	1.52 ** [a,b] (0.58)	4.57	2.05 *** [b] (0.64)	7.77	YES
Child is female	-0.05 (0.12)	0.95	0.08 [a,b] (0.19)	1.08	0.42 [a] (0.27)	1.52	-0.81 * [c] (0.32)	0.44	-0.28 [b,c] (0.28)	0.76	YES
Child age at preschool (months)	0.26 *** (0.08)	1.30	0.30 ** [a] (0.11)	1.35	0.33 * [a] (0.14)	1.39	0.41 † [a] (0.22)	1.51	-0.04 [b] (0.14)	0.96	YES

Notes. All continuous variables have been standardized and, therefore, the odds ratios correspond to a one standard deviation change in the predictor. Different superscripts within each row indicate significant differences across groups. Gray blocks refer to significant differences within the Latino population. Data were drawn from the ECLS-B.
*** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.

Table 3.

Predictors of preschool enrollment as compared with informal care.

	Likelihood of being enrolled in preschool versus informal care										Moderation Evidence
	Overall		U.S.-born White		U.S-born Black		U.S-born Latino		Foreign-born Latino		
Variable	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Race/ethnicity (vs. U.S.-born White)											
U.S.-born Black	0.23 (0.18)	1.26	--	--	--	--	--	--	--	--	--
U.S-born Latina	-0.37 † (0.21)	0.69	--	--	--	--	--	--	--	--	--
Immigrant Latina	-0.33 (0.28)	0.72	--	--	--	--	--	--	--	--	--
Family necessity											
Mom employed part-time	0.18 (0.20)	1.20	0.42 (0.30)	1.52	0.19 (0.47)	1.21	-0.67 (0.58)	0.51	0.02 (0.62)	1.02	NO
Mom employed full-time	-0.22 (0.19)	0.80	-0.20 (0.29)	0.82	0.03 (0.50)	1.03	-0.87 (0.55)	0.42	0.01 (0.49)	1.01	NO
Mom non-standard work schedule	0.09 (0.17)	1.09	0.40 (0.25)	1.49	-0.19 (0.45)	0.83	-0.06 (0.61)	0.94	-0.44 (0.43)	0.64	NO
Mom enrolled in classes	0.11 (0.17)	0.90	0.05 (0.25)	1.05	0.26 (0.35)	1.30	-0.19 (0.51)	0.83	0.72 (0.62)	2.05	NO
Father in household	0.21 (0.16)	1.23	-0.08 (0.29)	0.92	0.49 (0.35)	1.63	0.47 (0.36)	1.51	0.51 (0.50)	1.67	NO
Relative in household	0.03 (0.16)	1.03	-0.13 (0.25)	0.88	-0.07 (0.31)	0.93	0.61 (0.40)	1.60	0.12 (0.32)	1.13	NO
Number of siblings under 18	-0.22 *** (0.07)	0.80	-0.14 [a] (0.12)	0.87	-0.35 **[a,b] (0.13)	0.70	-0.53 ***[b] (0.14)	0.59	-0.13 [a] (0.14)	0.88	YES
Child care and preschool flexibility	-0.24 ** (0.08)	0.79	-0.35 ** [a] (0.11)	0.70	-0.11 [a,b] (0.25)	0.90	-0.07 [b] (0.19)	0.93	0.06 [a,b] (0.19)	1.06	YES
Home quality and resources											
High school diploma/GED	-0.63 ** (0.24)	0.53	-0.52 (0.39)	0.59	-1.34 * (0.63)	0.26	-1.00 (0.76)	0.37	-0.31 (0.55)	0.73	NO
Some college	-0.54 ** (0.19)	0.58	-0.52 * (0.25)	0.59	-1.28 * (0.59)	0.28	-0.23 (0.77)	0.79	-0.58 (0.61)	0.56	NO
Bachelor's degree	-0.18 (0.19)	0.84	-0.13 (0.23)	0.88	-0.61 (0.51)	0.54	0.19 (0.74)	1.21	-0.60 (0.64)	0.55	NO
Annual income: $0-$20,000 (G1)	-0.14 (0.26)	0.87	-0.26 [a, b] (0.41)	0.77	0.88 [a] (0.93)	2.41	-1.41 † [b] (0.81)	0.24	0.86 [a] (0.65)	2.36	YES

Table 3 continued on next page.

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Table 3 (continued)

| | Likelihood of being enrolled in preschool versus informal care | | | | | | | | | | Moderation Evidence |
| | Overall | | U.S.-born White | | U.S-born Black | | U.S-born Latino | | Foreign-born Latino | | |
	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Annual income: $20,001-$40,000 (G2)	-0.38 † (0.21)	0.68	-0.25 (0.27)	0.78	0.40 (0.83)	1.49	-1.12 (0.75)	0.33	0.12 (0.62)	1.13	NO
Annual income: $40,001-$100,000 (G3)	-0.06 (0.20)	0.94	-0.10 (0.26)	0.90	0.68 (0.78)	1.97	-0.70 (0.63)	0.50	1.02 (0.70)	2.77	NO
Systemic connections	0.03 (0.09)	1.03	-0.05 [a] (0.16)	0.95	0.10 [a b] (0.17)	1.10	0.44 * [b] (0.22)	1.55	-0.05 [a] (0.26)	0.95	YES
Parenting quality low (G1)	0.08 (0.17)	1.08	0.18 (0.27)	1.20	0.22 (0.33)	1.25	0.17 (0.47)	1.19	-0.43 (0.37)	0.65	NO
Parenting quality high (G5)	0.02 (0.19)	1.02	0.18 (0.24)	1.20	-0.89† (0.53)	0.41	-0.15 (0.55)	0.86	-0.03 (0.60)	0.97	NO
Importance of academic for K	0.32 *** (0.09)	1.38	0.39 ** [a] (0.13)	1.48	0.71 ** [a] (0.24)	2.03	0.26 [a,b] (0.25)	1.30	-0.29 [b] (0.26)	0.75	YES
Importance of behavior for K	-0.24 ** (0.08)	0.79	-0.27 * [a] (0.11)	0.76	-0.56 * [a] (0.25)	0.57	-0.41 * [a] (0.20)	0.66	0.19 [b] (0.23)	1.21	YES
Child factors											
Child functioning low (G1)	0.12 (0.15)	1.13	-0.08 (0.24)	0.92	0.36 (0.40)	1.43	-0.06 (0.43)	0.94	0.33 (0.31)	1.39	NO
Child functioning high (G5)	0.09 (0.15)	1.09	0.07 (0.20)	1.07	0.23 (0.40)	1.26	0.50 (0.51)	1.65	-0.00 (0.49)	1.00	NO
Supply side of the community											
Child care and preschool competition	-0.02 (0.07)	0.98	-0.03 (0.10)	0.97	-0.10 (0.16)	0.90	-0.01 (0.17)	0.99	0.07 (0.20)	1.07	NO
Proportion of working moms	-0.06 (0.07)	0.94	0.02 (0.10)	1.02	-0.16 (0.20)	0.85	-0.24 (0.21)	0.79	-0.11 (0.18)	0.90	NO
Subsidy waitlist	0.08 (0.07)	1.08	0.21 † [a] (0.11)	1.23	-0.31† [b] (0.18)	0.73	-0.42 † [b] (0.22)	0.66	0.48 * [a] (0.22)	1.62	YES
Difficulty finding care	-1.04 *** (0.11)	0.35	-0.95 *** (0.16)	0.39	-1.29*** (0.30)	0.28	-1.45 *** (0.33)	0.23	-1.08 ** (0.33)	0.34	NO
Midwest	-0.78 ** (0.27)	0.46	-0.06 [a] (0.33)	0.94	-2.28 ** [b] (0.87)	0.10	-2.18 ** [b] (0.79)	0.11	-1.36 † [a,b] (0.73)	0.26	YES
South	-0.68 ** (0.23)	0.51	0.02 [a] (0.25)	1.02	-1.28 [b] (0.78)	0.28	-1.21 [b] (0.78)	0.30	-2.34 ***[b] (0.63)	0.10	YES
West	-0.68 ** (0.25)	0.51	0.12 [a] (0.32)	1.13	-2.02 * [b] (0.84)	0.13	-1.89 ** [b] (0.73)	0.15	-1.78 ** [b] (0.63)	0.17	YES

Table 3 continued on next page

Table 3 (continued)

| | Likelihood of being enrolled in preschool versus informal care | | | | | | | | | | Moderation Evidence |
| | Overall | | U.S.-born White | | U.S-born Black | | U.S-born Latino | | Foreign-born Latino | | |
Variable	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	B (SE)	OR	
Urban	0.11 (0.18)	1.12	0.16 (0.21)	1.17	-0.11 (0.51)	0.90	0.43 (0.81)	1.54	-0.65 (0.79)	0.52	NO
Cultural factors											
Mother citizenship status	-0.40 (0.31)	0.67	--	--	--	--	--	--	-0.53 (0.39)	0.59	N/A
Mother English proficiency	0.05 (0.11)	1.05	--	--	--	--	-1.28 *[a] (0.57)	0.28	0.19 [b] (0.15)	1.21	YES
Spanish speaking community	-0.02 (0.10)	0.98	-0.20 (0.22)	0.82	0.28 (0.42)	1.32	-0.06 (0.24)	0.94	-0.06 (0.16)	0.94	NO
Bilingual community	0.02 (0.11)	1.02	0.12 (0.21)	1.13	-0.22 (0.41)	0.80	-0.11 (0.21)	0.90	0.15 (0.24)	1.16	NO
Preschool cultural consistency	-0.21 ** (0.07)	0.81	-0.23 * (0.11)	0.79	-0.16 (0.15)	0.85	-0.42 * (0.17)	0.66	-0.26 † (0.14)	0.77	NO
Covariates											
Mother age	0.08 (0.07)	1.08	0.08 (0.10)	1.08	0.01 (0.16)	1.01	0.22 (0.21)	1.25	0.07 (0.19)	1.07	NO
Child age of first care	0.35 *** (0.09)	1.42	0.33 ** (0.11)	1.39	0.29 (0.25)	1.33	0.52 * (0.23)	1.68	0.43 * (0.21)	1.54	NO
Other non-parental care age 2	-0.55 *** (0.16)	0.58	-0.64 **[a] (0.23)	0.53	-0.91 ** [a] (0.35)	0.40	0.30 [b] (0.37)	1.35	-0.96 †[a] (0.58)	0.38	YES
Center-based care at age 2	0.87 *** (0.23)	2.39	0.69 † (0.36)	1.99	0.84 † (0.49)	2.32	1.26 * (0.52)	3.53	0.86 (0.91)	2.36	NO
Child is female	0.16 (0.11)	1.17	0.17 (0.15)	1.19	0.09 (0.25)	1.09	-0.30 (0.33)	0.74	0.40 (0.30)	1.49	NO
Child age at preschool (months)	0.32 *** (0.06)	1.38	0.34 *** (0.10)	1.40	0.38 * (0.16)	1.46	0.23 (0.16)	1.26	0.19 (0.15)	1.21	NO

Notes. All continuous variables have been standardized and, therefore, the odds ratios correspond to a one standard deviation change in the predictor. Different superscripts within each row indicate significant differences across groups. Gray blocks refer to significant differences within the Latino population. Data were drawn from the ECLS-B.
*** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.

Chapter 3: Preschool Education and Children's Academic Achievement from Early Childhood through Adolescence

ABSTRACT

Using data from the Early Childhood Longitudinal Study Kindergarten cohort of 1998 (ECLS-K; $n = 6,970$), this study examined the short- and long-term benefits of preschool education for children's math and reading achievement. Results from this effort revealed that, despite the partial convergence of academic test scores through the end of the first grade school year, children who attended preschool at age four consistently outperformed their classmates who attended informal care through early adolescence. The long-term advantages of preschool were largely explained by the fact that preschool attendees entered kindergarten with a stronger academic skill set. Although all children benefited from preschool, there was also evidence for systematic heterogeneity, with findings supporting developmental theories on cumulative advantage and diverging destines.

INTRODUCTION

Socio-economic gaps in educational attainment are established early in the life course, and once these gaps are established, children's prospects of upward mobility are dim (Kalil, 2015). The school transition model connects these gaps in early learning to later periods by elucidating the ways in which these initially small differences in early childhood accumulate into long-term differences in educational attainment (Alexander &

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Entwisle, 1988). This theoretical model suggests that these school entry skills shape children's early experiences, including their interactions with teachers and classmates (Entwisle, Alexander, & Olson, 2005), curricular placement (Winsler et al., 2012, 2013), and interactions with their family (Ansari & Crosnoe, 2015b; Crosnoe, Augustine, & Huston, 2012), such that these systems act on the initial disparities and compound them from year-to-year. These socio-economic gaps in early learning, therefore, are the underpinning for later inequality, which is why the early years serve as a critical juncture in shaping children's long-term educational careers (Heckman, 2008).

There is an extensive body of literature documenting preschool programs as a potential equalizer of children's early learning across the socio-economic gradient (Gormley et al., 2005; Magnuson et al., 2007; Weiland & Yoshikawa, 2013), yet much less is known about how these programs affect the long-term school success of children, and whether these programs can reduce the long-term disparities in school achievement (Crosnoe, 2007; Rumberger & Tran, 2006). In this spirit, this study uses data from the Early Childhood Longitudinal Study Kindergarten Cohort (ECLS-K) of 1998 to examine the long-term associations between preschool participation and children's academic achievement. As part of this effort, this study also considers *why* programs may have long-term benefits for children and for *whom* these benefits may be strongest. By advancing our understanding of the efficacy of preschool education, as well as providing insight into potential sources of heterogeneity and underscoring the mechanisms of preschool effects, the results of this dissertation will push the early childhood field forward and have implications for both policy and practice.

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BACKGROUND

Benefits of Preschool Education

The short-term associations between preschool participation and academic achievement are fairly clear (Ansari & Winsler, 2012, 2016; Bassok, 2010; Bumgarner & Brooks-Gunn, 2014; Magnuson & Waldfogel, 2005; Puma et al., 2010; Votruba-Drzal, Coley, Collins, & Miller, 2015; Weiland & Yoshikawa, 2013). Children who attend preschool—especially those of high quality—enter school more ready to learn than children who experience informal care. These benefits are largely explained by the quality of programs (Dowsett et al., 2008; Fuligni, et al., 2009; Votruba-Drzal et al., 2004). For instance, children who attend informal care are more likely to watch television during school, are engaged in less cognitively stimulating activities, have fewer educational resources, and have fewer interactions with adults when compared with their peers who attend formal preschool programs (Bumgarner & Brooks-Gunn, 2014; Clarke-Stewart & Allhusen, 2005; Dowsett et al., 2008).

Although there is a rich literature documenting the short-term benefits of preschool education, the long-term effects are more ambiguous. Classical experimental evaluations of small model programs, like Perry Preschool and the Carolina Abecedarian Project (Campbell et al., 2012; Schweinhart, 2006), have revealed that investments in early childhood programs hold great promise in breaking the intergenerational transmission of inequality. For example, the recent follow-up to the Abecedarian Project revealed that the children who attended the program during early childhood were more likely to graduate from college and had greater annual earnings when compared with

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children in the control group (Campbell et al., 2012). Other localized intervention programs have also been found to improve adulthood outcomes (Sorensen, Dodge, & The Conduct Problems Prevention Research Group, 2015). Yet, when taken to scale in recent years, the efficacy of such programs has been questioned (Hill et al., 2015; Lipsey et al., 2015; Magnuson et al., 2007; Puma et al., 2010) with the short-term impacts persisting at full strength for 1-2 years beyond the program year before dissipating (Leak et al., 2010).

The few existing efforts at estimating these long-term associations between contemporary preschool programs and children's later school success have also been limited as they have often taken place in localized communities. For example, analyses of both Tulsa's (Hill et al., 2015) and Miami's (Ansari et al., in press) universal preschool programs and of other early childhood initiatives in North Carolina (Muschkin et al., 2015) suggest that certain subgroups of children may exhibit benefits through the end of the third grade year. Evidence for the sustained effects of early childhood programs also comes from the NICHD Study of Early Child Care and Youth Development, which has documented long-term academic advantages of high quality preschool programs (Belsky et al., 2007; Vandell et al., 2010). The limitation of this work, however, is that these data do not capture the experiences of ethnically diverse families. Accordingly, the long-run effects of preschool education for these groups of children remains in question, in part due to the inadequate data available to measure these associations.

Convergence and the Mechanisms Underlying the Benefits of Preschool

The literature on contemporary preschool education also suggests that program benefits may "fadeout" because children who enter kindergarten without a preschool

background and, thus with lower academic skills, may accelerate in their learning over time and effectively catch up with their classmates who entered school with preschool experiences and stronger academic abilities (Hill et al., 2015; Magnuson et al., 2007; Puma et al., 2012). Conversely, classic evaluations of early childhood programs (Ramey & Ramey, 2006; Schweinhart, 2005) and theories from the economic literature on skill building (Cunha et al., 2006) reveal that early intervention may have long-term benefits for children because human capital investments accumulate over time; thus, the skills developed during these early years may bolster subsequent development.

Given the aforementioned data limitations, two remaining developmental and policy questions that have yet to be answered are: (a) *why* do preschool programs have benefits for children five to ten years later; and (b) if there is evidence for convergence of preschool effects, *when* does it occur. With the national push to expand preschool education, it is of utmost importance to clarify the ways in which these long-run effects may be sustained. As discussed above, the most basic explanation for the sustained effects of early childhood programs is that the differences in children's school entry skills that are linked to preschool participation are maintained over time (i.e. sustainability; Ansari et al., in press; Vandell et al., 2007). That is, preschool programs prepare children for kindergarten, which in turn support children's later educational outcomes. Addressing these questions regarding the long-term benefits of preschool and periods of convergence has important policy implications as it could point to potential sensitive periods that can be targeted for maintaining the initial advantages conferred by early childhood programs.

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Heterogeneity in Preschool Effects

Although policy-makers have long been interested in the "average" associations between intervention programs and children's developmental outcomes, there has been growing interest in heterogeneity (Duncan & Magnuson, 2013; Duncan & Vandell, 2012). By examining the distributional effects of preschool and uncovering which children benefit the most for preschool education, this empirical inquiry has the potential to increase our understanding of the processes involved in facilitating children's educational prospects, both in the short- and long-term (Cooper & Lanza, 2014; Miller et al., 2014; Puma et al., 2012; Purtell et al., 2016; Votruba-Drzal et al., 2004).

A common policy question has been whether early education services should be targeted at low-income families or, alternatively, serving all children and families across the country (i.e., universal). These services, regardless of method of delivery, are intended to equalize access to preschool education among children and families who have a low propensity for selecting into preschool. For example, preschool attendance among children from lower income, unemployed, and non-English speaking Latino homes remains relatively low (Child Trends, 2012). Yet, not all low-income and non-English speaking Latino families prefer informal arrangements; in fact, many do choose preschool education for their children (Ansari & Winsler, 2012). In other words, we know that there are children who are *unlikely to attend preschool, but do*, in addition to children who are *likely to attend preschool, but do not*. Although these differences broadly reflect disadvantaged and advantaged populations, they are not simply due to any

one factor (e.g., income, race/ethnicity, community factors) and are likely to be much more dynamic and additive than they have been treated in the extant literature.

For both policy and practice, we need a better understanding of the early educational experiences of these disadvantaged children and families. In studying these children, we can assess the extent to which preschool programs have a compensatory effect; in other words, we can determine whether the benefits of preschool are greatest for children who are unlikely to attend, but whose families enroll them anyway. We can also test developmental theories about cumulative advantage (Ceci & Papierno, 2005) and contrast the experiences of disadvantaged children who enroll in preschool with their more advantaged counterparts who either attend preschool or are cared for by a parent/relative. Thus, using children's propensity for preschool enrollment as a moderator of preschool effects provides a window of opportunity to delve into the implications of the expansion of preschool programs that are being targeted at underserved families across the country (for a similar procedure using marriage and crime, see King, Massoglia, & MacMillan, 2007). Importantly, we can look at these developmental processes both through the transition to school and over the long run to determine whether minimizing disparities during the early years minimizes long-term inequality (Alexander et al., 1988; Heckman, 2008).

The Current Study and Hypotheses

In sum, the final two goals of dissertation are to add to the existing body of literature on preschool education by considering the long-term effects of preschool. Specifically, I address the following four questions:

Research Question 1: Are there academic benefits of preschool education for

    children as they transition into middle childhood and adolescence?

Research Question 2: Is there evidence for convergence of test scores across

    preschool participants and non-participants and, if so, when does it occur?

Research Question 3: What share of the sustained benefits of preschool education

    is a result of earlier skill development?

Research Question 4: To what extent are the benefits of preschool education

    conditioned on children's propensity for preschool enrollment?

First, I hypothesized that there would be evidence for both short- and long-term effects of preschool participation on children's academic achievement, but that these benefits would shrink over time. I expected that by the end of middle school, the benefits of preschool would be smaller than the benefits accrued at kindergarten entry. Considering that the extant literature has not thoroughly addressed *when* convergence of test scores occurs, I did not make any directional hypotheses; however, I did expect that the observed long-term associations between preschool programs and children's academic success would be explained in large part by their earlier skill gains. Finally, in line with the compensatory hypotheses (Sameroff & Chandler, 1975), it was expected that children who were unlikely to attend preschool, but did, would benefit most from such participation, whereas children who were likely to attend preschool, but did not (versus those who did), would benefit less.

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METHOD

Data and Sample

Data for Aims 2 and 3 of this dissertation were drawn from the ECLS-K 1998

Cohort (Tourangeau et al., 2009), a nationally representative sample of 21,409

kindergarteners who were followed from kindergarten entry through the end of eighth-

grade. Children were followed across six waves of data collection: (1) the fall of

kindergarten; (2) the spring of kindergarten; (3) the spring of first grade; (4) the spring of

third grade; (5) the spring of fifth grade; and (6) the spring of eight grade. Across each

time point, information was collected from parents, teachers, and school administrators as

well as direct assessments of children. For the purposes of this study, I restricted the

sample to children who: (a) participated in data collection through the end of the eighth

grade; (b) were first time kindergartners; and (c) had preschool information at age 4,

resulting in a final sample of 6,970 children (per IES and NCES requirements, all sample

sizes have been rounded to the nearest 10). See Table 4 for sample descriptives stratified

by children's age 4 preschool arrangement, both before and after matching (propensity

score matching is discussed in more detail below).

Measures

Preschool enrollment. Parents reported whether children were enrolled in a

preschool or Head Start program, or whether a relative, or they as the parent, cared for

their child during the year leading up to kindergarten.[8] Similar to prior studies on

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[8] The small share of children who attended two or more child care and/or preschool arrangements (3%) and whose location of care varied throughout the preschool year (1%) were dropped from all analyses.

preschool education, children who attended relative care and parental care were collapsed into one larger category of informal care (see also, Ansari & Crosnoe, 2015; Iruka, Gardner-Neblett, Matthews, Winn, 2014; Tucker-Drob, 2012). As a precaution, preliminary analyses established that there were no differences between these two conditions. Thus, the focal predictor was a binary marker of preschool enrollment (1 = *enrolled in a preschool program*, 0 = *no preschool enrollment*).[9] Moreover, Head Start was removed from the preschool category because prior studies have shown that there are no benefits of Head Start participation in the ECLS-K, as compared with parental care, through the transition into kindergarten (Magnuson et al., 2007) and that children who attended Head Start perform more poorly over time (Curenton et al., 2015). Also, it was not possible to achieve optimal balance across the Head Start and preschool conditions when using propensity score matching, even within the low-income sample. Thus, children who participated in Head Start were excluded from all analyses.

Children's academic achievement. Children's math and reading skills were directly assessed from kindergarten through eighth grade using age standardized assessments developed by the NCES (α's = .92-.94; for more information on these measures, see: Rock & Pollack, 2002). Content from the reading assessment covered letter recognition, reading, and phonological awareness, whereas the math assessment covered children's conceptual knowledge, procedural knowledge, and problem solving skills. The earlier assessments during kindergarten and first grade emphasized basic

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[9] Alternative definitions of preschool were also considered (e.g., any exposure) and results were largely the same as those reported below.

reading and math skills, whereas the later assessments placed a stronger emphasis on more advanced academic skills (e.g., reading comprehension and algebra).

Covariates. To reduce the possibility of spurious associations, all analyses accounted for a theoretically relevant set of covariates. At the child-level, models adjusted for: children's age at school entry, children's age of first care, children's gender (male and female), children's race/ethnicity (Black, Latino, Asian/other, and White as referent), and children's disability status (yes, no). Covariates at the family- and household-level were as follows: mothers' employment status (full time, part time, and unemployed as the referent), mothers' years of education, mothers' nativity (U.S.-born or foreign-born), mothers' marital status (single, separated, and married as the referent), mothers' age, home learning activities, parents' school involvement, educational resources in the home, number of siblings, household size, household income, household language (language minority or English), receipt of Temporary Assistance for Needy Families, receipt of Food Stamps, urbanicity (suburbs, town, rural, and large city as the referent), and region (Midwest, South, West, and Northeast as the referent).

Analyses Plan

As with any study of preschool education, a key concern is the issue of endogenity—any association between preschool participation and children's school success may be driven by the selection factors or other omitted variables, thereby, undermining causal inference. To address the issues of endogeneity and selection, I used propensity score matching, such that I used the conditional probability of attending preschool given a set of covariates (Rosenbaum & Rubin, 1983) to create matched

samples. For the matching models, I used the nearest neighbor method (with four matches) within a caliper of .01, ensuring a sufficient overlap between the two preschool conditions on their propensity scores.

The focal objectives for Aim 2 were addressed within these matched samples. With regard to the short- and long-term associations between preschool and children's learning and development, I estimated fully saturated path models (see Figure 1a). To ensure that the models were unbiased, I controlled for all covariates when estimating path models within the matched samples (i.e., doubly robust estimation; Funk et al., 2011). To assess for convergence, I employed a Wald's test that compared the regression slopes of preschool and children's academic achievement over time. The INDIRECT command was used to estimate the indirect effects and total effects of preschool on children's academic learning over time; in doing so, I could assess the extent to which the long-term benefits of preschool were attributed to earlier skill development. To do so, all models were re-estimated and included autoregressive pathways across waves (see Figure 1b).

With respect to Aim 3, and similar to Heckman's effect of the treatment for people at the margin of indifference (Heckman, 2005), I also used the propensity scores to assess the relative association of preschool education and children's academic achievement for those who were unlikely to enroll in preschool and who enrolled anyway, and for those children who were likely to enroll in preschool but did not enroll. Thus, rather than using the propensity scores as a means of matching children across conditions and negating issues of selection, which is how it is commonly used in the literature (and in Aim 2), as part of Aim 3, I incorporated this estimate as a moderator of

the associations between preschool enrollment and children's short- and long-term school

success (see also, King et al., 2007). These models were estimated with interaction terms

(propensity score X preschool arrangement).

Given the use of propensity score matching, these analyses were not weighted to

be nationally representative because population weights were not specific to these

analyses (see also, Curenton et al., 2015; Magnuson et al., 2004, 2007). All models

incorporated were clustered at the school level to adjust for shared variance. To address

missing data, 50 datasets were imputed via chained equations in the Stata program (Stata

Corp, 2009), which were then exported to Mplus (Muthén & Muthén, 2008-2013).

RESULTS

Across the 50 imputed datasets, I was able to successfully match 93-95% of

children across preschool and informal care. To assess the overall quality of matches, I:

(a) checked the standardized mean differences between preschool and informal care for

all of the covariates using the 10% benchmark; and (b) regressed each of the covariates,

individually, on the indicator variable that distinguished children in informal care as

compared preschool within the matched samples. As can be seen in Table 4, before

matching, almost all of the covariate contrasts were significantly different; after

matching, however, there were no longer any significant differences. Likewise, all of the

standardized mean differences across the preschool and informal care groups were less

than 10% of a standard deviation, which, when taken together, indicate that balance was

successfully achieved (for an illustration of the propensity score plots, before and after matching, see Figures 2a and 2b).

     Long-term benefits of preschool participation. Having successfully balanced the two preschool conditions, I proceeded to estimating path models within the matched samples. As can be seen in Table 5, results from these analyses revealed that children who attended preschool at age 4 scored significantly higher on kindergarten assessments of math and reading (ES = 0.18 and 0.18). Similar, albeit slightly smaller, associations emerged at the end of: kindergarten (ES = 0.13 and 0.13), first grade (ES = 0.08 and 0.09), third grade (ES = 0.09 and 0.08), fifth grade (ES = 0.09 and 0.06), and eighth grade (ES = 0.10 and 0.08). Thus, children who attended preschool at age 4 consistently scored higher on assessments of math and reading through the end of the middle school as compared with children who were not enrolled in a formal early childhood program.

     Convergence of test scores. Having illustrated both the short- and long-term associations between preschool participation and children's early learning and development, I proceeded to the next objective: to assess whether, and when, convergence of test scores occurs. To assess for convergence, I employed a Wald's test that compared the regression slopes of preschool participation from either: (a) baseline to each of the subsequent waves (t_x-t_1) or (b) from one wave to the next (t_x-t_{x-1}). The first set of analyses illustrates *whether* there is empirical evidence for convergence of test scores from kindergarten through eighth grade, whereas the second set of analyses illustrates *when* convergence occurs. There would be evidence for convergence if the Wald's Test were statistically significant, indicating that the regression slopes changed over time.

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As can be seen in columns 3 and 4 of Table 5, results from these analyses indicated that, as compared with baseline, the benefits of preschool shrunk over time (Wald χ^2 from kindergarten through eighth grade = 6.33-16.40, ps < .05). Specifically, across waves, roughly 33-72% of the initial associations between preschool attendance and children's academic achievement were maintained (calculated by dividing the effect size for each wave by the baseline effect size). By the end of middle school, 44 and 56% of the initial effects of preschool were sustained for reading and math, respectively.

However, this convergence of test scores across preschool and informal care occurred almost entirely through the end of the first grade year. As can be seen in columns 5 and 6 of Table 5, the initial benefits of preschool participation shrunk by 28% for reading (1-[0.13/0.18], Wald χ^2 = 6.33, p < .05) and 28% for math (1-[0.13/0.18], Wald χ^2 = 7.28, p < .01) from the fall to the spring of the kindergarten year. Similarly, these benefits shrunk by an additional and 38% for math (1- [0.08/0.13], Wald χ^2 = 4.28 p < .05) from the spring of kindergarten to spring of first grade .Although not reaching conventional levels of statistical significance, there was a 31% attenuation for children's reading performance from the spring of kindergarten to spring of first grade (1-[0.09/0.13], Wald χ^2 = 2.52, p = .10). There was no further attenuation in the benefits of preschool education, from one year to the next, after the spring of the first grade year (Wald χ^2 from third grade to eighth grade = 0.02-0.65, ns).

Thus, there was empirical evidence for convergence of test scores; however, these multivariate analyses did not indicate whether this convergence was due to "fade out" among preschool attendees, or "catch-up" among non-preschool participants. To help

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elucidate this matter, I plotted the predicted standardized test scores of children in preschool and informal care. As can be seen in Figures 3a and 3b, these plots revealed that—all things being equal—this convergence of test scores from kindergarten through first grade was due to a mixture of "fade-out" (see the downward slope of the solid black line) among preschool attendees and "catch-up" (see the upward slope of the dotted black line) among children who were enrolled in informal care at age 4.

Indirect effects of preschool participation. The third objective was to determine whether the associations between early care and education programs and children's long-term development were mediated by their earlier skill gains (using the INDIRECT command in Mplus). Despite evidence for convergence, results from these mediational models indicated that the long-term associations between preschool enrollment and children's academic functioning were almost entirely due to children's earlier skill development, with indirect effects ranging from 5-15% of a standard deviation. Put another way, these earlier academic skills accounted for 63-138% of the total direct effect and were largely driven by children's kindergarten readiness (calculated by dividing the indirect effect by the direct effect). The indirect effects were at times larger than the direct effects due to convergence of test scores across informal care and preschool (see also, Muthén & Muthén, 1998-2013). Thus, there was no evidence for sleeper effects and little support for the skill-begets-skill hypothesis; rather, preschool programs provided children with a small boost for kindergarten, which was partially sustained over time.

Robustness of preschool effects. One common issue in the early care and education literature and the social sciences more broadly has been concerns of omitted

variable bias that may invalidate findings within the contexts of correlational research. To address these issues, I employed a replacement of cases framework, which quantifies how many cases would have to be replaced with counterfactual cases (with a zero effect) to invalidate an inference (Frank, Maroulis, Duong, & Kelcey, 2013). In doing so, this framework enables me to quantify bias within the context of non-random assignment.

Results from this effort revealed that the benefits of preschool education upon kindergarten entry would become non-significant if 66-70% of cases were replaced with a zero effect. Similar, albeit slightly smaller, estimates were derived for the spring of kindergarten through the spring of eighth grade. Specifically, to invalidate the longer-term benefits of preschool education it is necessary to replace 16-53% of cases with data for which there is no effect. Even in the smallest instance (spring of fifth grade, reading = 16%), these estimates suggest that roughly 1,050 cases would have to be replaced to negate the benefits of preschool. Taken together, these estimates reveal that to invalidate inference, on average, 41% of children would have to exhibit academic benefits because of an unadjusted factor—even after adjusting for background characteristics through PSM—rather than as a result of preschool education itself. Thus, these results were fairly robust and, importantly, exceeded the estimates documented in other observational studies published within the field educational policy (average = 32%; Frank et al., 2013).

Heterogeneity in preschool effects. In the analyses described above, the propensity scores were used in a traditional approach, namely to balance children across the preschool conditions and estimate the average effect of the treatment on the treated, thereby minimizing concerns of selection. In this next set of analyses for the third and

final aim of this dissertation, I model selection into preschool as a potential moderator of preschool effects on children's academic learning. However, prior to estimating these models, two precautions were taken.

First, the correlation between children's propensity for preschool enrollment and each of the covariates was assessed to determine whether the propensity score was unique from each of the individual covariates. As can be seen in Table 6, the correlations were small-to-moderate, ranging from |.02-.58|, indicating that children's likelihood of preschool enrollment was not being driven by any one factor. Even maternal education, which exhibited the strongest correlation, only explained roughly a third of the variance in parents' preschool selection. Thus, the propensity score does in fact reflect differential selection into preschool, which is greater than any individual child or family factor (see also, Coley et al., 2014; Crosnoe et al., 2016). Relatedly, in the main effects models (not shown), children's propensity for preschool enrollment—net of all covariates—was uniquely associated with 8 of the 12 academic outcomes, which reiterates that the propensity for preschool enrollment was greater than any one individual factor.

Second, I examined the distribution of the propensity scores as a function of children's actual preschool arrangement to ensure that there was a sufficient number of children who fell at the margins (for an illustration, see Figure 4). These descriptive analyses revealed that 17% of children were not aligned with their propensity score: 9% of children had a low propensity for preschool enrollment and enrolled in preschool anyway and 8% of children had a high propensity for preschool enrollment and were enrolled in informal care (see Table 7). There was a sufficient number of children at the

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margins, therefore, to estimate the conditional effects of preschool education as a function of children's likelihood of preschool enrollment.

Having established the validity of the propensity score as a potential moderator, I proceeded to estimate the conditional effects of preschool participation on children's academic learning from kindergarten through eighth grade (see Table 8 for coefficients from the interaction model). Results from these analyses revealed that the effects of preschool on children's math and reading test scores were, in fact, conditioned on their likelihood of preschool enrollment, and this was generally true from the fall of kindergarten through the spring of first grade. To interpret the interactions, I calculated the predicted outcome scores for different combinations of preschool education and children's propensity scores (using standard deviation cut points). As can be seen in Figure 5, all children benefited from participation in preschool education upon kindergarten entry; in fact, children who had a low likelihood of enrolling in preschool, but did attend preschool anyway, scored comparably on both assessments of math and reading as compared with their classmates who had a high propensity for preschool enrollment and who remained at home. Children who had a high propensity for preschool enrollment, however, were the group that benefited most from preschool education.

Similar interactions were documented at the end of kindergarten and the end of first grade years, but there was evidence for fadeout among children who had a low propensity for preschool enrollment. Specifically, as can be seen in Table 8, the academic benefits of preschool by the end of kindergarten attenuated by 88% (math: 1-[0.01/0.08]) and 117% (reading: 1-[-0.02/0.12]) for children who had a low propensity for preschool

enrollment, which was significantly greater than children with a high propensity for preschool participation who experienced a reduction of 50% (math: 1-[0.11/0.22]) and 30% (reading: 1-[0.14/0.20]). When taken together, these results indicate that, for the most part, all children benefit from enrollment in preschool in the immediate term, but these benefits fade more rapidly through the end of first grade for those children who had a low (versus high) propensity for enrolling in preschool.

What happens from third grade through eighth grade? Results from these analyses revealed that there were no significant interactions (see Table 8), suggesting that the benefits of preschool education converge across the various thresholds for preschool enrollment. In other words, by the end of the third grade year—and through the end of eighth grade—all children benefit equally from preschool education. Why does this convergence occur? To answer this question I plotted the predicted test scores from kindergarten through eighth grade for children who attended preschool and informal care, stratified by their propensity score (both significant and not). As can be seen in Figures 6a and 6b, I find that, all things being equal, this convergence occurs because the children who had a high propensity for preschool enrollment, but attended informal care, made larger gains as compared their classmates who had a high propensity for preschool enrollment and attended preschool. Plotting children's test scores also reveals that, although preschool was equalizing children's academic performance during the transition into kindergarten, there was evidence for diverging destinies (McLanahan, 2004). Upon kindergarten entry there were *no* differences in the academic skills of children who had a low propensity for preschool enrollment and who attended preschool as compared with

children who had a high propensity but attended informal care; at the end of the eighth grade year, however, there were larger differences in their academic skills, corresponding to roughly a quarter (reading) to over a third (math) of a standard deviation.

DISCUSSION

There is a great deal of experimental (e.g., Campbell et al., 2002; Schweinhart et al., 2006) and correlational (e.g., Ansari & Winsler, 2016; Crosnoe, 2007; Magnuson et al., 2007; Weiland & Yoshikawa, 2013; Winsler et al., 2007) evidence to suggest that quality early childhood education programs can be leveraged to boost young children's early learning and development. Despite the wealth of empirical inquiry into early childhood education, two points of discussion remain contested: (a) whether these programs continue to have benefits for children throughout the elementary school years and beyond; and (b) which children benefit the most from preschool education. The second and third aims of this dissertation were geared at addressing these gaps in the knowledgebase. Below, I discuss four take home messages of this work.

Results from this study revealed that children who attended preschool at age 4 not only outperformed their classmates in areas of academic achievement upon kindergarten entry, but these benefits were sustained over time, which contrasts with some other emerging studies from across the country (e.g., Hill et al., 2012; Lipsey et al., 2015; Magnuson et al., 2007; Puma et al., 2012). Yet, similar to the published literature, there was evidence to suggest that the initial advantages conferred by preschool programs shrunk over time; the benefits of preschool participation reduced in size by approximately

half once children were nine years from the end of preschool. Nonetheless, the results reported herein are in line with recent evaluations of early care and education and intervention programs in North Carolina (Muschkin et al., 2015) and Miami (Ansari et al., in press), and suggest that preschool programs do have benefits for children in the long run. Importantly, these results build on these local community efforts by revealing that the advantages that persisted through the end of the third grade school year were largely maintained through the end of middle school. Not only were there these advantages statistically significant, but the documented benefits of preschool education exceeded the benchmarks put forward by Chetty and colleagues (2011; 0.04-0.07 SDs) with respect to programs "breaking even" and matched the more conservative estimates developed by Magnuson and Duncan (2014; 0.09-0.15 SDs).

By using six waves of data that spanned across nine years, this study was also able to pinpoint the periods in which convergence of test scores occurred. This empirical inquiry revealed that convergence of test scores across preschool and informal care groups happened almost entirely during the two years after preschool. After the first grade year, the initial advantages conferred by preschool programs were largely maintained. These findings build on prior studies that suggest that preschool effects converge over time (e.g., Magnuson et al., 2004) and dissipate by roughly 2-3% of a standard deviation per year (Leak et al., 2010). If these results are replicated across different samples, then these findings indicate that to maintain preschool effects—which has been central to the discourse on preschool education—policymakers and researchers should focus on the two years after the end of preschool as a potential point of

intervention. In doing so, we can better understand *how* to sustain the academic gains made by children through the transition to kindergarten. For example, studying the school environment during kindergarten and first grade can potentially provide answers for maintaining preschool effects (see also, Jenkins et al., 2015; Magnuson et al., 2007). Alternatively, providing booster interventions *after* the preschool year can also prove to be effective in maintaining the initial advantages conferred by preschool programs (for a discussion of booster interventions see: Tolan, Gorman-Smith, Henry, & Schoeny, 2009).

An unresolved question, however, is whether this convergence of test scores is a result of fadeout among preschool attendees or catch-up among children who attended informal care. Some prior work suggests that this convergence occurs, in part, because non-participating children "catch-up" with their classmates who attended preschool (e.g., Lipsey et al., 2015; Magnuson et al., 2004). Results from this study, however, were less conclusive: children who attended preschool lost some ground in areas of math and reading, while non-participating children made up for some of the initial differences, which, when taken together, resulted in convergence. Considering that "fadeout" refers to the diminishing return of preschool education, these results indicate that the term "convergence" may be more appropriate, and that future researchers should model the underlying causes for the diminishing returns of preschool participation over time.

The third key point of this study centered on the underlying reasons for the long-term benefits of preschool education. Resonating with some of the recent empirical literature (Ansari et al., in press; Barnett, 2011; Vandell et al., 2010), I found that the long-term advantages of preschool education were a function of children's school entry

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skills. Thus, there was little support for the skill-begets-skill hypotheses, which argues that early education programs may have long-term benefits because human capital investments accumulate over time (Cunha et al., 2006) or the "sleeper-effects" phenomena, which argues that program benefits may emerge later in the life course even in the absence of initial programmatic benefits (Magnuson et al., 2007). There was no "break" in the benefits of preschool, nor did the initial academic advantages that resulted from preschool accumulate from year-to-year; rather, enrollment in a preschool program provided children with a small academic boost for kindergarten, which was partially sustained over time through the end of middle school.

Finally, the fourth take home message of this study concerned the potential for heterogeneity in the effects of preschool, which has been of growing interest to researchers and policymakers alike (Duncan & Magnuson, 2013; Duncan & Vandell, 2012; Yoshikawa et al., 2013). To date, however, much of the focus has been on individual child or family characteristics, when, in reality, the conditional effects of preschool are likely to occur at the intersection of numerous factors. In this study, I used propensity score matching to exploit selection as a potential moderator of preschool effects. In other words, rather than treating "selection" as a problem to be addressed—the traditional use of propensity score matching—this study modeled children's propensity for preschool enrollment as a potential source of heterogeneity in capturing the experiences of disadvantaged children and their more advantaged counterparts. In doing so, I documented fairly consistent evidence for moderation through the end of first grade, which coincides with the aforementioned periods of convergence. Results were both

promising and cause for concern, but have several implications for policy and practice. Before discussing these points, it should be reiterated that selection into preschool as presently defined captured the various advantages and disadvantages faced by children and families and cut across various layers of the family and community systems (e.g., ethnic minority status, socio-economic status, household resources, nativity, region, urbanicity), that irrespective of preschool enrollment, predicted children's school success.

Promisingly, preschool education was equalizing the academic performance of children upon kindergarten entry across the propensity score distribution: children who had a low likelihood of enrolling preschool, but attended, scored comparably to their classmates who had a high likelihood of preschool participation but did not participate. Said another way, preschool education equalized disadvantaged (low propensity) children's academic performance with their more advantaged (high propensity) peers through the transition to school. These findings likely reflect that fact that preschool programs were equalizing the contextual and educational resources available to children (see also, Crosnoe et al., 2010). Through the end of the first grade year, however, fadeout occurred more strongly among the disadvantaged children who had a low-propensity for preschool participation. These latter findings are somewhat contrary to the extant literature, which finds that preschool education is particularly effective for the most disadvantaged populations (Gormley et al., 2008; Weiland & Yoshikawa, 2013; Yoshikawa et al., 2013), but are in line with developmental theories on cumulative advantage (Ceci & Papierno, 2005). These differences across this study and the prior literature might be due to the fact that the quality of the preschool programs attended by

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children who had a low propensity for enrollment was not good enough, especially when compared with their more advantaged peers. Unfortunately, the ECLS-K was not equipped with the data necessary to address this possibility. Although these data suggest that universal early childhood education would not close the disparities in children's early academic achievement, they do reveal that *all* children can (and do) benefit from preschool participation during the year before kindergarten.

A greater cause for concern, however, was that despite the fact that preschool education equalized children's academic achievement upon kindergarten entry, there was evidence for "diverging destinies" (McLanahan, 2004), with disadvantaged children who attended preschool falling behind by as much as a third of a standard deviation through the end of middle school as compared with their more advantaged classmates who remained at home. This divergence is concerning because much of the existing discourse on disparities in academic achievement has been geared towards children's school entry skills, with the goal of minimizing differences in early childhood so that they do not accumulate and translate into long-term differences in educational attainment (Alexander et al., 1988; Entwisle & Alexander, 2005). Yet, even when preschool education equalized children's academic achievement, children who had a low propensity for preschool enrollment were not following a similar trajectory as their more advantaged peers. This divergence is not entirely surprising given disadvantaged children who finish preschool go back to lower quality neighborhoods and schools (Crosnoe & Cooper, 2010; Curenton et al., 2015; Pianta, Belsky, Houts, & Morrison, 2007), which in turn impact their later school success (Currie & Thomas, 2000; Zhai, Raver, & Jones, 2012). Thus, to believe

that preschool is a panacea for the disadvantages faced by children throughout the life course, in the absence of other supports, is, as argued by Brooks-Gunn (2003), "to believe in Magic". Ultimately, the unfavorable circumstances faced by disadvantaged children place many barriers to and constraints on their ability to succeed, and although preschool programs can temporarily address these barriers, high quality schooling and continued supports for children are necessary throughout the elementary school years and beyond to sustain the initial benefits conferred by preschool education.

Limitations and Conclusions

Despite these contributions to the early care and education literature, there are a number of limitations that need to be acknowledged. Primarily, this study did not capture the different kinds of preschool programs attended by children (e.g., center-based care and public school pre-K) to tease apart the heterogeneity that exists within this broader umbrella of preschool (Ansari et al., in press; Coley, Votruba-Drzal, Collins, DeMeo, 2016; Grindal & López, 2016). Thus, continued work is necessary to understand *which* programs confer greater benefits for children, and *why*. Preschool programs are multifaceted, and identifying the key features and design characteristics of early childhood programs that are linked with children's early school success are necessary. Second, given the use of propensity score matching, these analyses were not weighted to be nationally representative because population weights were not specific to this work (see also, Curenton et al., 2015; Magnuson et al., 2004, 2007). Nonetheless, outside of work done by the NICHD Network (Belsky et al., 2007; Vandell et al., 2010) and older experimental trials (Campbell et al., 2002; Reynolds et al., 2001; Schweinhart et al.,

2056), this study is one of the few to consider the benefits of contemporary preschool programs through the middle school years and illustrate when convergence occurs and why programs have long-term benefits for children.

Third, despite the use of propensity score matching with a rich set of child and family covariates, these results do not imply cause and effect as it is not possible to rule out differential selection into preschool that result from unmeasured confounds and, thus, could not be accounted for in these models. Finally, the academic skills of children are only one—albeit an important (Duncan et al., 2007)—domain of learning and development. Future studies, therefore, should consider other outcomes of interest, such as children's social-behavior and executive functioning As with most large-scale data, the ECLS-K 1998 cohort is somewhat limited in that only teacher and parent reports were available for children's social-behavior (and there were no measures of executive function), which are often not intended to measure change over time. The ECLS-K 2011 cohort, however, does have direct assessments of children's executive functioning; thus, future studies should leverage these newer data to consider how preschool participation is linked with children's cognitive flexibility and working memory. The limitation of the ECLS-K 2011 cohort is that data on children's development and functioning are not available after second grade and, therefore, the long-term associations between preschool participation and children's learning and development cannot be examined.

With these associated limitations in mind, the current study provides correlational evidence to suggest that preschool education can have academic benefits for all children throughout middle childhood and early adolescence. Although preschool programs can be

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an effective means of reducing short-term disparities in children's early academic skills, in the long run, these programs, short of other supports, are not—and should not be expected to be—a remedy for educational inequality throughout the life course. The bottom line, therefore, is that we need to rethink the expectations of early childhood programs and what can be done from a policy perspective to supplement preschool education and promote healthy child development.

Table 4.
Descriptive statistics of the focal variables in the ECLS-K, before and after matching.

Variable	Before matching			After matching		
	Informal care	Preschool	Sig. Diff.	Informal care	Preschool	Sig. Diff.
Child age at K entry (months)	65.75 (4.16)	65.99 (4.12)	*	65.94 (4.18)	65.99 (4.12)	
Child age of first care (months)	19.70 (19.55)	23.57 (19.58)	***	23.69 (20.69)	23.55 (19.57)	
Child gender (male)	0.50	0.51		0.51	0.51	
Child has a disability	0.12	0.14	†	0.15	0.14	
Child is White	0.61	0.71	***	0.71	0.71	
Child is Black	0.07	0.08		0.08	0.08	
Child is Latino	0.21	0.12	***	0.12	0.12	
Child is Asian/other	0.11	0.09	**	0.09	0.09	
Mom is employed full time	0.48	0.43	***	0.44	0.43	
Mom is employed part time	0.22	0.25	***	0.26	0.25	
Mom is unemployed	0.30	0.32	†	0.30	0.32	
Mothers' years of education	13.55 (2.63)	14.67 (2.37)	***	14.70 (2.56)	14.68 (2.37)	
Mother is foreign born	0.21	0.14	***	0.15	0.14	
Mother is married	0.76	0.84	***	0.83	0.84	
Mother is separated	0.13	0.10	***	0.10	0.10	
Mother is single	0.11	0.07	***	0.07	0.07	
Mothers' age	33.59 (6.38)	34.97 (5.76)	***	34.88 (6.11)	34.96 (5.76)	
Home learning activities	2.77 (0.49)	2.82 (0.45)	***	2.83 (0.47)	2.82 (0.45)	
Parents' school involvement	3.84 (1.58)	4.35 (1.48)	***	4.35 (1.48)	4.35 (1.48)	
Educational resources	74.03 (59.98)	93.33 (60.65)	***	93.45 (63.51)	93.31 (60.64)	
Number of siblings	1.51 (1.17)	1.37 (1.00)	***	1.37 (1.00)	1.37 (1.00)	
Household size	4.63 (1.40)	4.38 (1.14)	***	4.37 (1.13)	4.38 (1.14)	
Home language not English	0.16	0.08	***	0.08	0.08	
Household income (/1000)	52.65 (57.83)	73.68 (67.62)	***	72.70 (69.28)	73.61 (67.55)	
Received TANF	0.08	0.04	***	0.05	0.04	
Received Food Stamps	0.14	0.07	***	0.08	0.07	
Large city	0.37	0.39	†	0.39	0.39	
Suburbs	0.33	0.41	***	0.41	0.41	
Town	0.14	0.10	***	0.10	0.10	
Rural	0.17	0.10	***	0.10	0.10	
Northeast	0.19	0.21	*	0.20	0.21	
Midwest	0.30	0.28	†	0.27	0.28	
South	0.27	0.31	***	0.32	0.31	
West	0.25	0.20	***	0.20	0.20	
Child math achievement						
Fall of kindergarten	-0.21 (0.92)	0.19 (1.03)	***	0.00 (0.94)	0.19 (1.03)	***
Spring of kindergarten	-0.18 (0.94)	0.17 (1.02)	***	0.04 (0.99)	0.17 (1.02)	***
Spring of first grade	-0.15 (0.98)	0.14 (0.99)	***	0.06 (1.00)	0.14 (0.99)	**
Spring of third grade	-0.17 (1.00)	0.16 (0.97)	***	0.06 (0.98)	0.16 (0.97)	***
Spring of fifth grade	-0.16 (1.03)	0.15 (0.95)	***	0.05 (0.99)	0.15 (0.95)	***
Spring of eighth grade	-0.17 (1.05)	0.15 (0.93)	***	0.04 (0.99)	0.15 (0.93)	***
Child reading achievement						
Fall of kindergarten	-0.21 (0.89)	0.19 (1.06)	***	0.01 (0.96)	0.19 (1.06)	***
Spring of kindergarten	-0.16 (0.90)	0.15 (1.06)	***	0.02 (0.98)	0.15 (1.06)	***
Spring of first grade	-0.15 (0.97)	0.14 (1.00)	***	0.05 (1.01)	0.14 (1.00)	***
Spring of third grade	-0.17 (1.02)	0.16 (0.95)	***	0.08 (0.98)	0.16 (0.95)	**
Spring of fifth grade	-0.17 (1.03)	0.16 (0.94)	***	0.09 (0.98)	0.16 (0.94)	**
Spring of eighth grade	-0.17 (1.04)	0.15 (0.94)	***	0.07 (0.97)	0.15 (0.94)	***

Notes. Proportions may not sum to 1.00 due to rounding. These data were derived from the ECLS-K 1998 cohort.
$n = 6,970$ before matching. $n = 6,500\text{-}6,600$ after matching. *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.

Table 5.

The associations between participation in preschool versus parental care at age 4 and children's math and reading achievement over time, using propensity score matched data.

Preschool vs. informal care	Direct effect model within the matched samples [a]						Total indirect effect model within the matched samples [a]			
	B	S.E.	Conv. with baseline [b]	% of initial effect maintained [c]	Conv. with prior wave [b]	% of effect maintained from prior wave [c]	B	S.E.	% of effect due to all prior skills [d]	% of effect due to K entry skills [d]
Math achievement										
Fall of kindergarten	0.18	(0.03) ***	---	---	---	---	---	---	---	---
Spring of kindergarten	0.13	(0.03) ***	YES **	72	YES**	72	0.14	(0.02) ***	108	108
Spring of first grade	0.08	(0.03) **	YES ***	44	YES *	62	0.11	(0.02) ***	138	138
Spring of third grade	0.09	(0.03) ***	YES **	50	NO	113	0.08	(0.02) ***	89	111
Spring of fifth grade	0.09	(0.03) ***	YES **	50	NO	100	0.08	(0.02) ***	89	100
Spring of eighth grade	0.10	(0.03) ***	YES **	56	NO	111	0.08	(0.02) ***	80	80
Reading achievement										
Fall of kindergarten	0.18	(0.03) ***	---	---	---	---	---	---	---	---
Spring of kindergarten	0.13	(0.03) ***	YES *	72	YES *	72	0.15	(0.02) ***	115	115
Spring of first grade	0.09	(0.03) **	YES ***	50	NO	69	0.10	(0.02) ***	111	122
Spring of third grade	0.08	(0.03) **	YES **	44	NO	89	0.06	(0.02) **	75	88
Spring of fifth grade	0.06	(0.03) *	YES ***	33	NO	75	0.06	(0.02) **	100	100
Spring of eighth grade	0.08	(0.03) **	YES **	44	NO	133	0.05	(0.02) *	63	63

Notes. Conv = Convergence. [a] The total direct effects model did not control for prior waves of achievement (see Figure 1A), whereas the total indirect effects model adjusted for prior waves of achievement (see Figure 1B). [b] To assess for convergence between preschool and informal care, a Wald's test was used. [c] To calculate the percent of effect maintained, the effect size for each wave was divided by the baseline effect size or the prior wave. [d] To estimate the proportion of the effect that was due to the prior skills, the indirect effect was divided by the direct effect. All models were pooled across 50 imputed datasets, controlled for a full set of covariates, and were clustered at the school level. All variables were standardized and, therefore, the unstandardized regression coefficients in this table correspond to effect sizes (i.e., standard-deviation units). These data were derived from the ECLS-K 1998 cohort.
*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 6.

Bivariate correlations between children's propensity for preschool enrollment and the covariates.

Variable	Propensity for preschool enrollment
Child age at K entry (months)	0.08 ***
Child age of first care (months)	0.27 ***
Child gender (male)	0.02
Child has a disability	0.05 ***
Child is Black (vs. White)	-0.03 *
Child is Latino (vs. White)	-0.42 ***
Child is Asian/other (vs. White)	-0.19 ***
Mom is employed full time (vs. unemployed)	-0.13 ***
Mom is employed part time (vs. unemployed)	0.04 *
Mothers' years of education	0.58 ***
Mother is foreign born	-0.26 ***
Mother is separated (vs. married)	-0.20 ***
Mother is single (vs. married)	-0.25 ***
Mothers' age	0.31 ***
Home learning activities	0.17 ***
Parents' school involvement	0.45 ***
Educational resources	0.44 ***
Number of siblings	-0.18 ***
Household size	-0.27 ***
Home language not English	-0.33 ***
Household income (/1000)	0.46 ***
Received TANF	-0.21 ***
Received Food Stamps	-0.29 ***
Suburbs (vs. large city)	0.12 ***
Town (vs. large city)	-0.21 ***
Rural (vs. large city)	-0.31 ***
Midwest (vs. Northeast)	-0.12 ***
South (vs. Northeast)	0.04 *
West (vs. Northeast)	-0.22 ***

Notes. These data were derived from the ECLS-K 1998 cohort.*** $p < .001$. ** $p < .01$. * $p < .05$.

Table 7.

Breakdown of propensity for attending preschool by whether the child actually attended informal care or preschool.

Propensity for preschool enrollment	Child was actually enrolled in…	
	Informal care	Preschool
Low (< -1SD)	27.95%	**8.90%**
Medium (mean)	63.78%	64.60%
High (> +1SD)	**8.27%**	26.50%

Notes. Bolded estimates correspond with children whose enrollment in preschool was not aligned with their propensity score. These estimates were derived from the ECLS-K 1998 cohort.

Table 8.

Conditional effects of participation in preschool versus informal care at age 4 and children's math and reading achievement over time.

Children's academic outcomes	Estimates from the interaction model						Effect size of preschool by preschool propensity	
	Preschool		Propensity score		Preschool X propensity score			
	B	S.E.	B	S.E.	B	S.E.	Low	High
Math achievement								
Fall of kindergarten	0.15	(0.02) ***	0.04	(0.07)	0.07	(0.02) ***	0.08	0.22
Spring of kindergarten	0.11	(0.02) ***	0.08	(0.07)	0.04	(0.02) †	0.07	0.15
Spring of first grade	0.06	(0.02) **	0.11	(0.07)	0.05	(0.02) *	0.01	0.11
Spring of third grade	0.09	(0.02) ***	0.16	(0.07) *	-0.00	(0.02)	0.09	0.09
Spring of fifth grade	0.08	(0.02) ***	0.17	(0.07) *	0.01	(0.03)	0.07	0.09
Spring of eighth grade	0.09	(0.02) ***	0.22	(0.07) **	-0.01	(0.03)	0.10	0.08
Reading achievement								
Fall of kindergarten	0.16	(0.02) ***	0.04	(0.07)	0.04	(0.02) †	0.12	0.20
Spring of kindergarten	0.11	(0.02) ***	0.05	(0.07)	0.06	(0.03) *	0.05	0.17
Spring of first grade	0.06	(0.02) **	0.04	(0.07)	0.08	(0.03) **	-0.02	0.14
Spring of third grade	0.06	(0.02) **	0.11	(0.07)	0.03	(0.02)	0.03	0.09
Spring of fifth grade	0.05	(0.02) *	0.12	(0.07) †	0.02	(0.02)	0.03	0.07
Spring of eighth grade	0.07	(0.02) **	0.18	(0.07) *	0.01	(0.02)	0.06	0.08

Notes. All variables were standardized and, therefore, the unstandardized regression coefficients in this table correspond to effect sizes (i.e., standard-deviation units). Gray blocks indicate evidence for heterogeneity. These estimates were derived from the ECLS-K 1998 cohort. *** $p < .001$. ** $p < .01$. * $p < .05$. † $p < .10$.
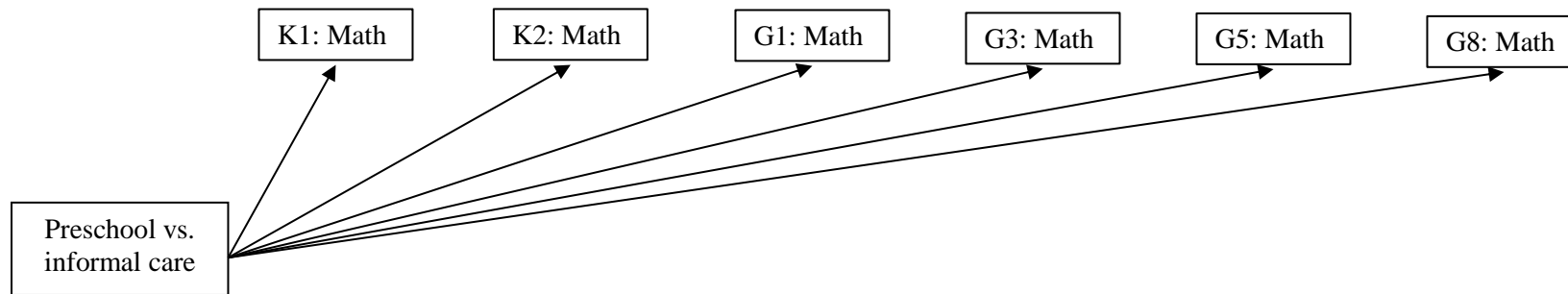
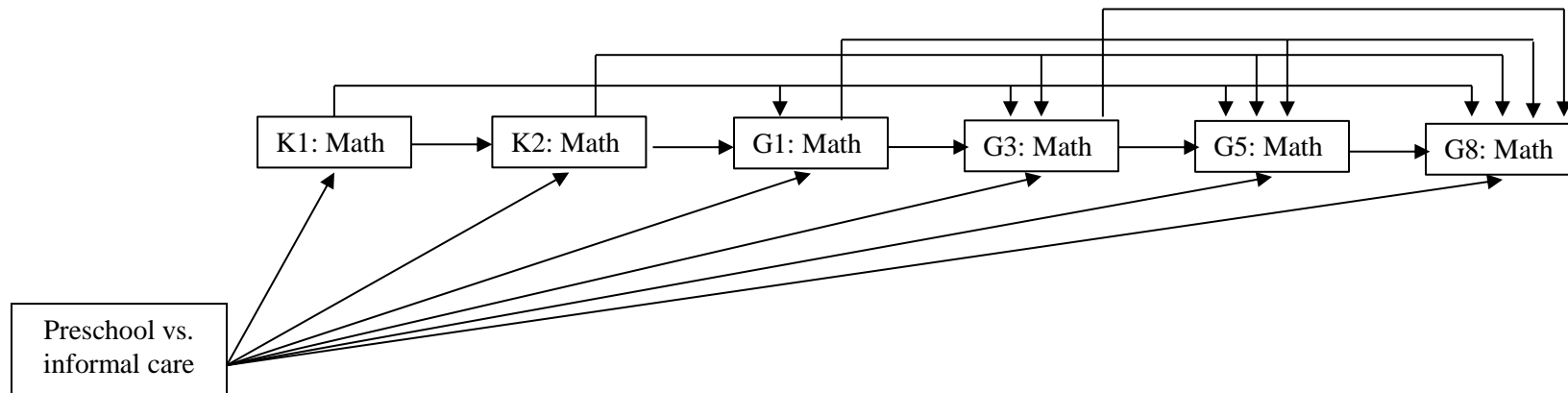Figure 1a. Illustrative example of the direct effect path models within the matched samples.

Figure 1b. Illustrative example of the total indirect effect path model within the matched samples.
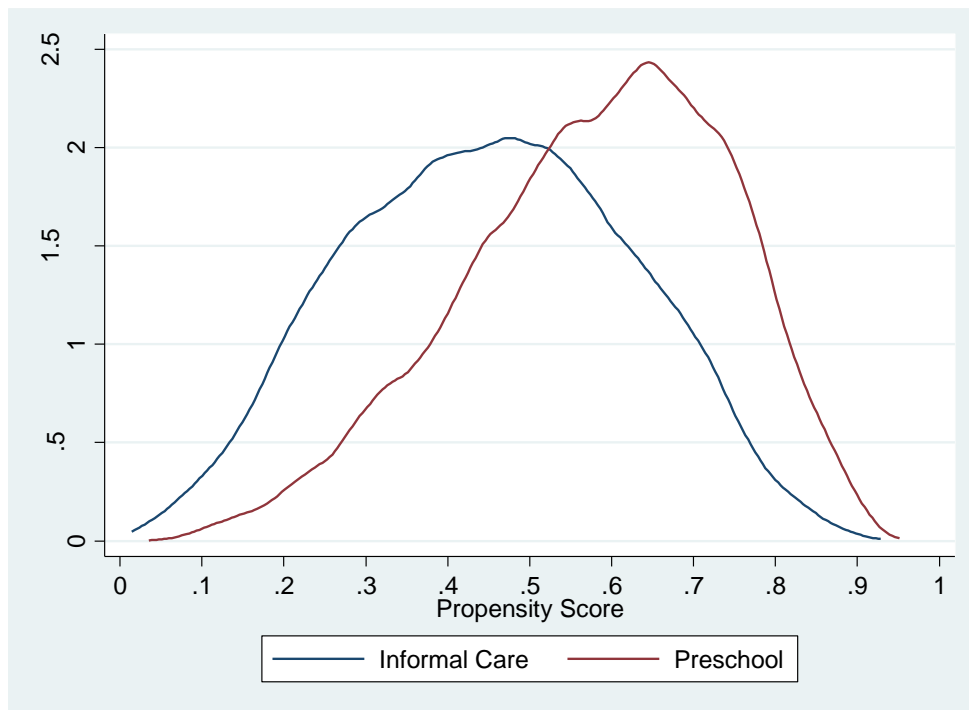
Figure 2a. Illustration of children's propensity scores for attending a formal preschool program before matching.
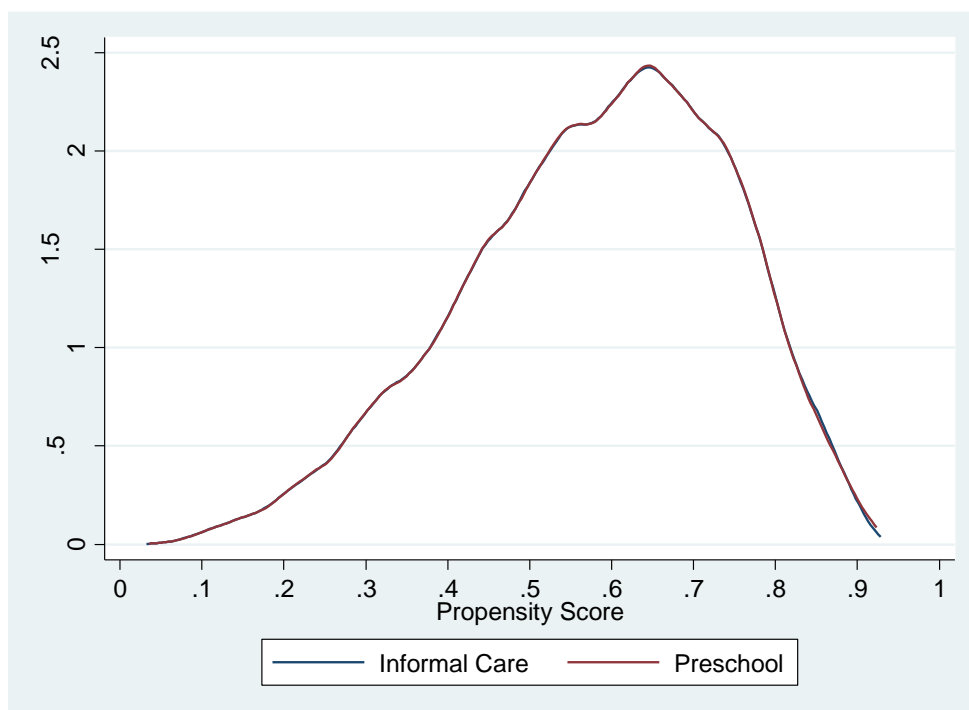

Figure 2b. Illustration of children's propensity scores for attending a formal preschool program after matching.
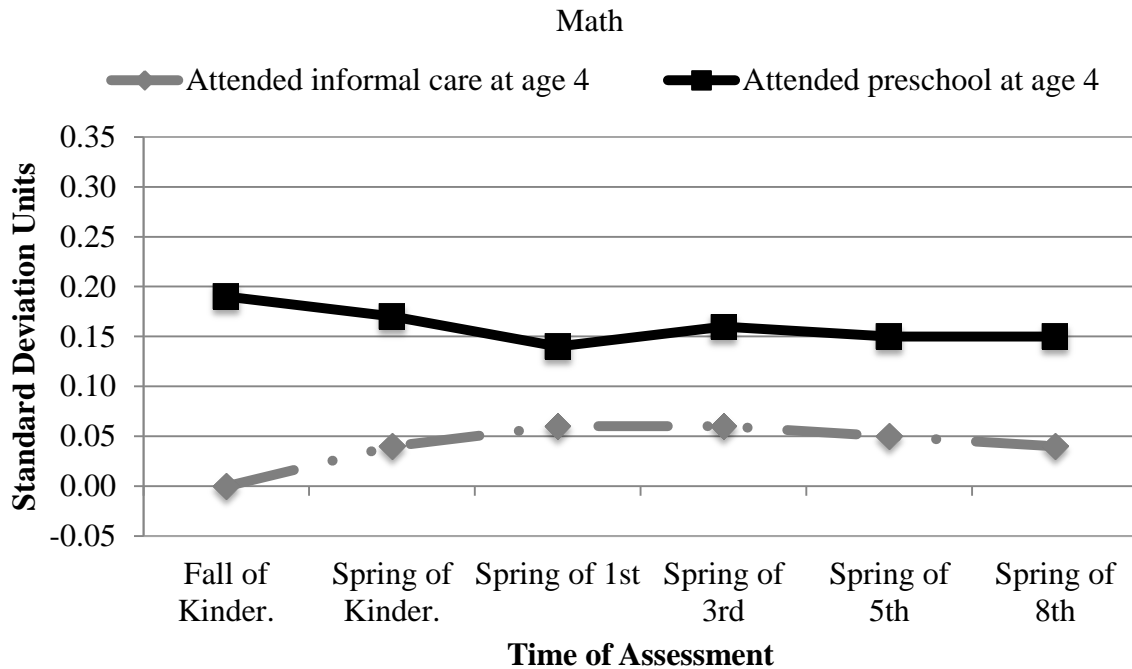
Math

Figure 3a. Plot of the math test scores from kindergarten through eighth grade for the average child in preschool as compared with informal care, using the matched ECLS-K samples.
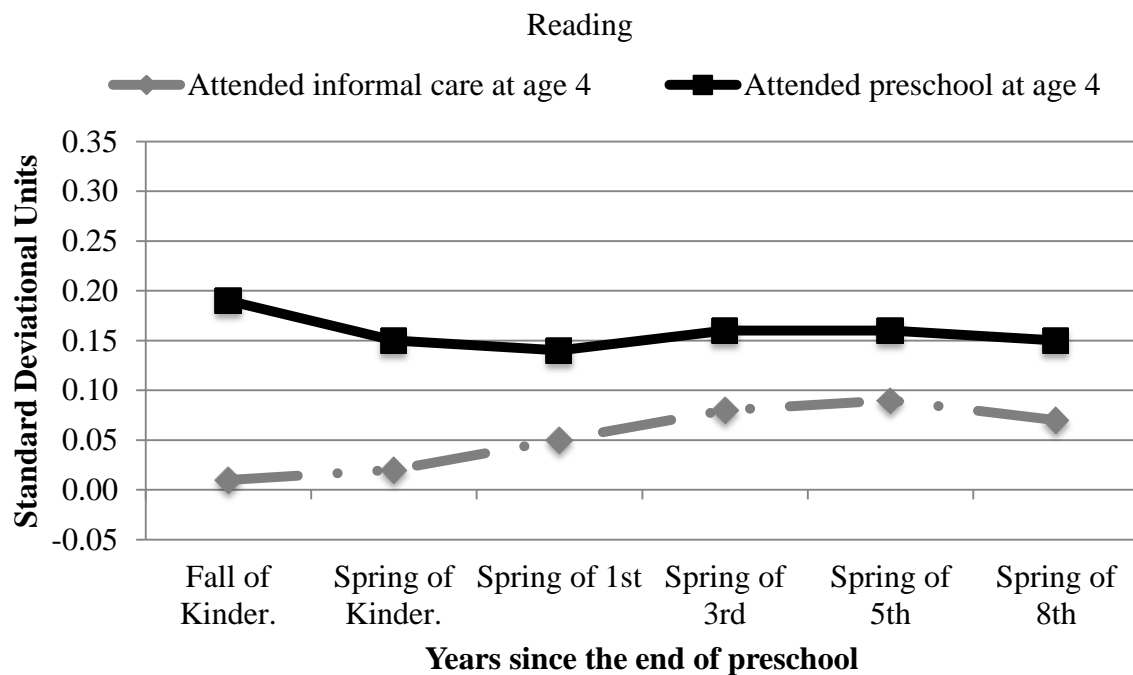
Reading

Figure 3b. Plot of reading test scores from kindergarten through eighth grade for the average child in preschool as compared with informal care, using the matched ECLS-K samples.
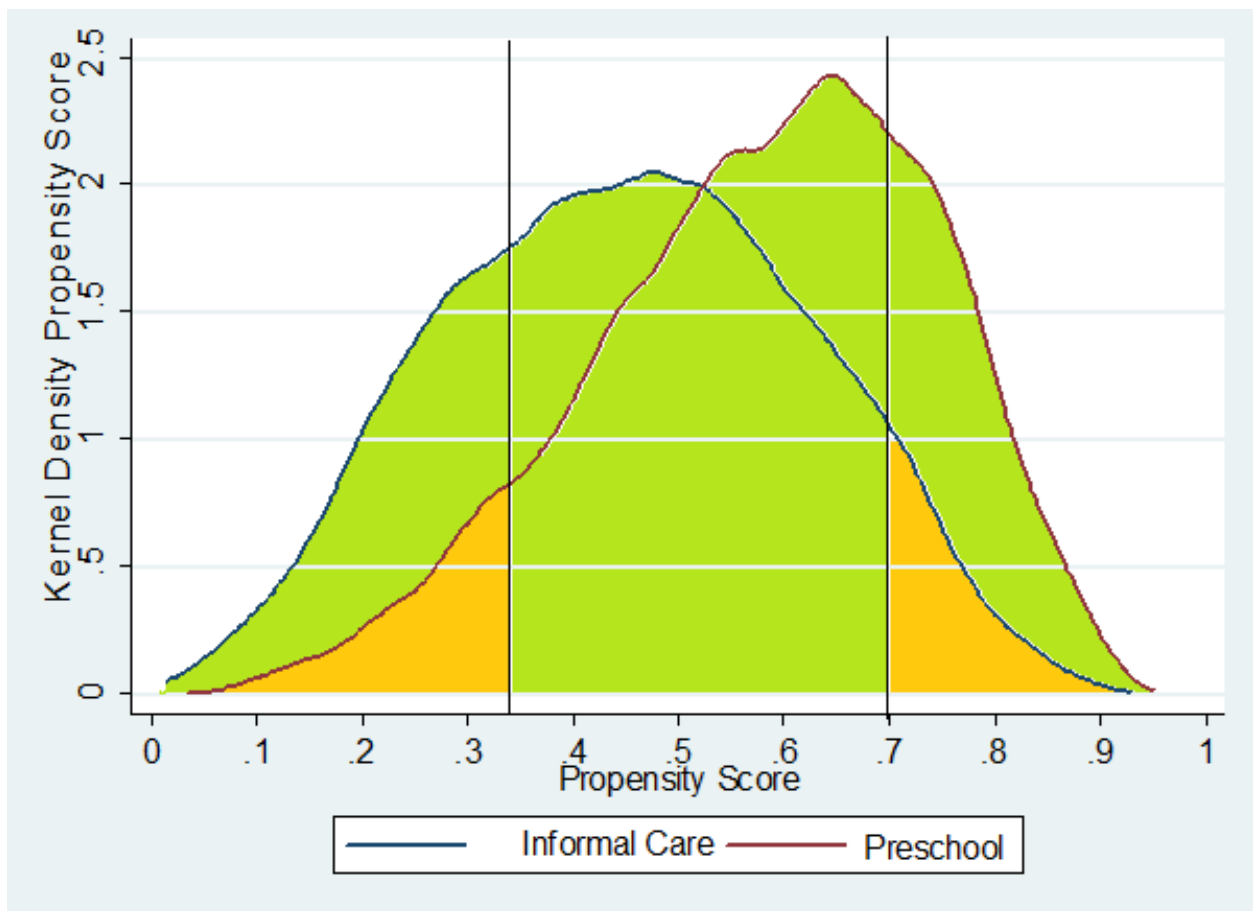
Figure 4. A kernel density plot illustrating children's propensity for preschool enrollment as a function of their actual preschool arrangement. Black lines at 0.34 and 0.69 correspond to the threshold for +/- 1 standard deviation. Areas under the curve shaded in green correspond to those children whose propensity scores and their preschool arrangement were aligned, whereas areas shaded in orange reflect those children whose arrangements were not aligned with their propensity scores.
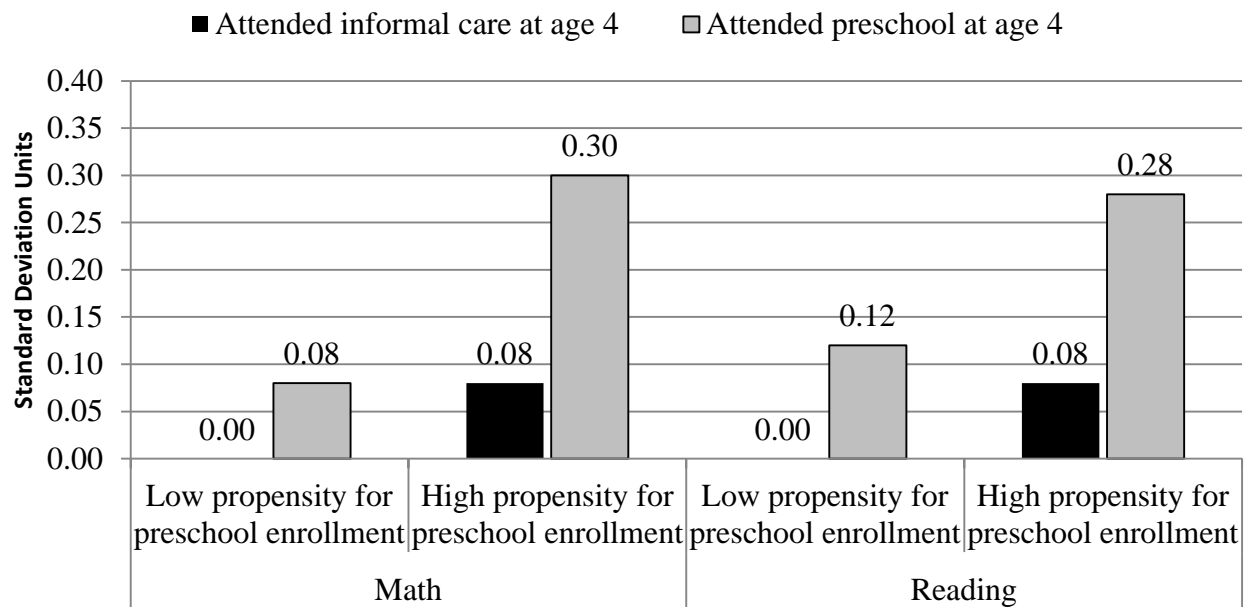
Figure 5. An illustration of the conditional effects of non-Head Start preschool participation (versus informal care) on children's math and reading achievement in the fall of kindergarten year as a function of children's propensity for preschool enrollment. To ease interpretation of the interactions, the mean for the "low propensity for preschool enrollment" at the fall of kindergarten was subtracted from each contrast. Thus, the estimates can be interpreted as effect size differences within the ECLS-K sample.
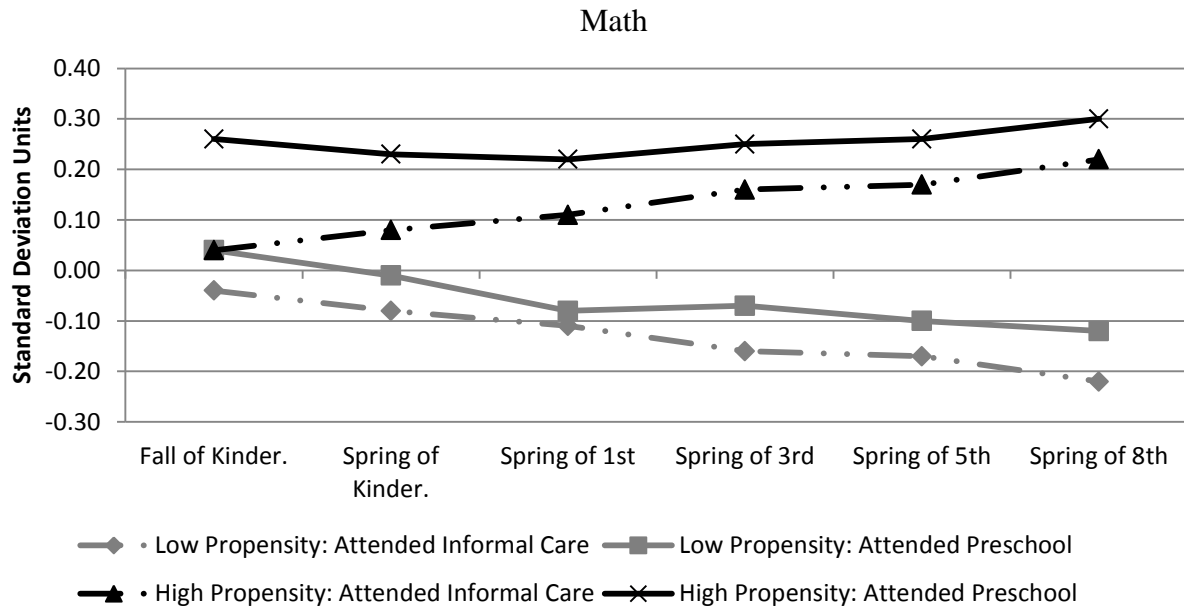
Math

Figure 6a. A plot of children's math performance over time as a function of their propensity to attend preschool and their actual attendance.
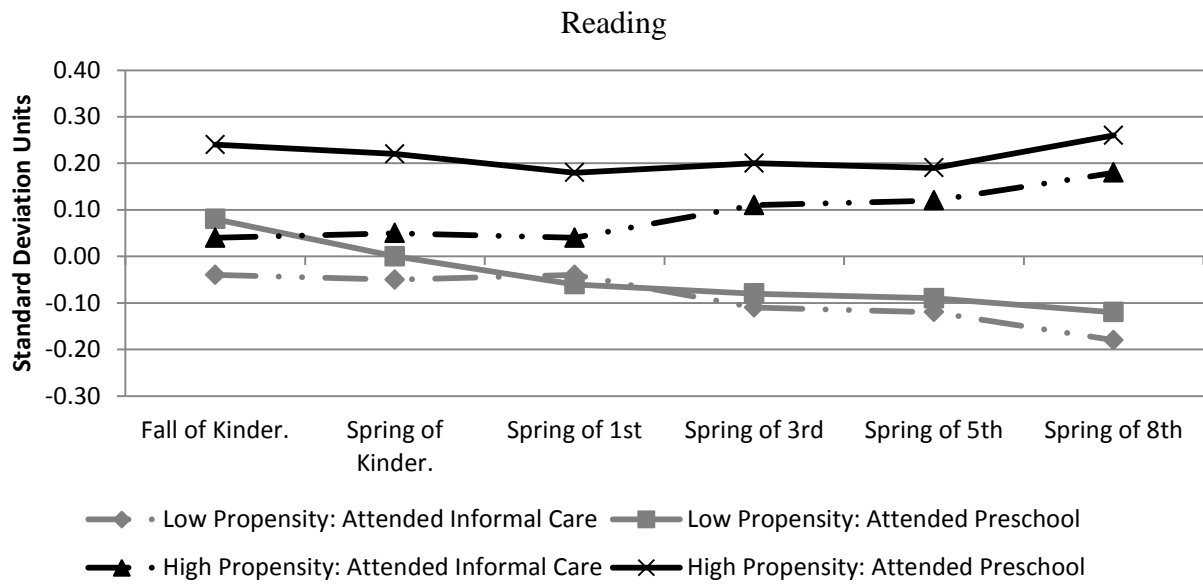
Reading

Figure 6b. A plot of children's reading performance over time as a function of their propensity to attend preschool and their actual attendance.

Chapter 4: Conclusion

Socio-economic and racial/ethnic gaps in educational attainment are established early in the life course (e.g., Bradbury et al., 2011; Kalil, 2015; Reardon, 2011), which is why a growing number of policy-makers, researchers, and practitioners have become interested in understanding how children's early ecologies contribute to their educational prospects (Duncan & Magnuson, 2013). Grounded in developmental and economic theory (Lerner, 2006; Meyers & Jordan, 2006), this dissertation sought to add to the discourse on early childhood education by examining the antecedents and outcomes of preschool programs for populations of interest in education policy.

The aims of this dissertation were threefold, which when taken together addressed some important gaps in the literature. The first aim of this dissertation was to understand why Latino children from immigrant and native-born households were under enrolled in preschool education across the country. Then, building on the first aim, the second and third objectives of this work considered the long-term benefits of preschool education for children, and the potential sources of heterogeneity in program benefits. Although the overall conclusions of this dissertation have been discussed at length above, I outline a number of the key themes and future directions that need to be considered below.

Primarily, the results of this dissertation underscore the need for a closer inspection of heterogeneity in the study of preschool. Across the three aims of this project, there was ample evidence for heterogeneity by ethnicity and nativity as well as children's propensity for preschool enrollment. These stratification systems not only

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conditioned the potential benefits of preschool education, but had important implications for the ways in which families engaged with the child care market. Thus, we need to move beyond the "average" associations in developmental and educational research and take a theoretically grounded approach in understanding systematic sources of variation. To the extent that we can uncover heterogeneous effects, then we can begin to understand both how and why certain early childhood programs are more effective than others.

A systematic analysis of heterogeneity is, of course, a difficult undertaking, and this dissertation only considered two potential moderators. There are other factors that deserve attention in future research and that could add to our understanding of the antecedents and outcomes of preschool education. Yet, we can only do as much the data we have available. As discussed throughout this dissertation, a common issue was small cell sizes, which hamper our ability to detect significant sources of variation. For example, these large-scale data did not have enough statistical power to examine variation as a function of sub-group heritage, which has important implications for family dynamics and children's early learning (De Feyter & Winsler, 2009). There was also not enough statistical power to tease apart different types of formal preschool programs, which is a limitation given findings about the variation in program efficacy by type of program (Ansari et al., in press; Grindal & López, 2016; Coley et al., 2016).

Relatedly, although this dissertation advanced our understanding of preschool selection and the child outcomes of preschool, there remain a number of unanswered questions. For example, while the quantitative methods from Chapter 2 established the selection mechanisms into preschool, they provided little insight into the complex

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motivations that underlie these behaviors; in other words, the results from Chapter 2 highlighted *what* care parents chose, but they did not delve into *why* they made these decisions. Uncovering parents' perceptions of their agency, their knowledge and awareness, and their experiences in navigating the child care system, which is not possible to generate with large-scale survey data, is a necessary future direction. Such contextualized inquiry that considers the dynamic and fluid nature of preschool selection from a Latino perspective is imperative, as there is little research to guide the development of culturally and contextually appropriate policies and practices that can be used to increase engagement of immigrant Latino families in the preschool market.

Next, it is important to acknowledge that the results of this dissertation on the long-term effects of preschool differ from some prior studies, such as those of the Head Start Impact Study (Puma et al., 2012), the experimental evaluation of pre-K programs in Tennessee (Lipsey et al., 2015), and the quasi-experimental evaluations of Tulsa's pre-K programs (Hill et al., 2015). One possible explanation for these differences is that the use of national data allows me to capture a wider range of experiences than some of the localized efforts (or those studying only one type of preschool program). Moreover, the current study compared the experiences of children who attended informal care as compared with preschool, which is not always the case for the aforementioned bodies of work. This final point is of note because programmatic impacts have been found to depend on the alternative type of care children experience in the comparison group (Feller, Grindal, Miratrix, & Page, 2016; Zhai, Brooks-Gunn, & Waldfogel, 2014). Put another way, preschool evaluations that do not consider what type of care the control

group children experience may fail to capture variation in program impacts. Nonetheless, there are a number of emerging correlational and quasi-experimental studies that have documented moderate to longer-term academic benefits for children (Ansari et al., in press; Muschkin et al., 2015; Vandell et al., 2007), similar to those reported herein.

Relatedly, the results from this dissertation on the long-term outcomes of preschool suggested that children who attended preschool, despite having a low propensity to do so, were diverging from their more advantaged peers. Although I speculate why this divergence might be occurring, future studies need to explicitly model the underlying causes for this divergence. Such work can help us understand whether this divergence across the propensity score distribution is a function of the type of elementary schools children experience after preschool, or if it reflects the different types of parenting and investments children experience at home that accumulate over time. These are important questions that need to be addressed because then, and only then, can we begin to understand how we can address issues of "fadeout" or "convergence" in preschool effects, which have been central to the discourse on educational policy and preschool education (Duncan & Magnuson, 2013; Yoshikawa et al., 2013).

Even though there are a number of unanswered questions, the results reported in this dissertation begin to provide some new interdisciplinary understanding of children and education systems for future interventions. As one example, the results of Chapter 2 revealed that policymakers need to pay careful attention to the different needs of families when it comes to preschool enrollment; to boost the participation of underserved families would require different policy initiatives. Such findings are particularly important as

much of the discourse surrounding the under-enrollment of Latino families has not considered variation within this population. The results of this work reveal that these families have different needs and experience different types of barriers that cut across various levels of the community and household systems. With respect to the child outcomes of preschool (Chapter 3), the consideration of heterogeneity in programmatic benefits revealed that, despite the potential long-term benefits of preschool, these programs did not inoculate children against lifetime of disadvantage (Brooks-Gunn, 2003; Zigler & Berman, 1983). Thus, from an intervention perspective, we need to consider what can be done to sustain preschool effects for the most disadvantaged children. To this end, this dissertation provided some of the first empirical evidence that indicates that educational policy and future interventions need to focus on the transition to elementary school as a potential period for maintaining the long-term academic benefits of preschool.

When taken as whole, the results of this dissertation advanced our knowledge about interventions and theory surrounding the development of children and education and the link between them in a number of ways. Ultimately, if future studies replicate the findings reported in this study, the implications for educational policy would be large as these results would push the early childhood field forward and lay the groundwork for addressing existing concerns about the under enrollment of Latino children in preschool and the long-term "convergence" of preschool effects.

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