Cognitive Development of Children in Immigrant Families: Living Arrangements and Parental Nativity

Abstract

Objective: This paper examines the associations between family living arrangements and children's cognitive scores for children of immigrants, relative to those of natives.

Background: Previous research has contributed immigrant children's cognitive advantage to their protective living arrangements, but no rigorous research has tested this hypothesis.

Method: Hybrid random- and fixed-effects regression models are used on the sample from the Early Childhood Longitudinal Study—2011 Kindergarten cohort.

Result: Single-parent family structure explains cognitive disparities between children (between-child effects); parental union status changes and transitions of grandparents explain the decline of cognitive scores within a child (within-child effects). Parental nativity significantly moderates the between- and within-child effects of family living arrangements, but the patterns vary across racial groups (moderation effects).

Conclusion: The current research provides both a limited support for and a challenge to the immigrant paradox hypothesis

INTRODUCTION

One in every four children in the United States is immigrant or lives with at least one foreign-born parent (Zong, Batalova, & Hallock, 2018). These children from diverse countries in Latin America, Asia, and Africa are the fastest growing population. The share of Hispanic children in the child population has grown from 9 percent in 1980 to 25 percent in 2015 (Child Trends Databank, 2014). Recently, Asians have become the largest immigrant group. Among recent arrivals, Asians outnumber Hispanics, and by 2065 the share of Asians in immigrant

population is projected to be the largest (López & Bialik, 2017). The growth of black immigrants from some non-Hispanic Caribbean countries (e.g. Jamaica, Haiti) and African countries (e.g. Nigeria, Ethiopia) is unprecedented. There are about 3.8 million of black immigrants, accounting for about 9 percent of the nation's black population in 2013, compared to only 3 percent in 1980 (Anderson, 2015). The growth of immigrants and their children implies that the nation's future will be defined by the well-being of the immigrant children.

Despite the higher poverty rates and lower levels of education of parents, children of immigrants perform well in school—a phenomenon called the "immigrant paradox". Many scholars argue that immigrant families are more protective due to familism—a strong sense of obligation to the well-being of the family (see below). When comparing with co-ethnic native counterparts, children of immigrants are more likely to live in a two-parent families and to have other adults in home, such as grandparents, aunts, and uncles (Landale, Thomas, & Van Hook, 2011, p. 46). Moreover, children of immigrants are less likely to experience parental union status or other living arrangement changes (Frank & Wildsmith, 2005; Phillips & Sweeney, 2006).

However, a closer look at the family structural resources and transitional patterns of immigrant families, it is uncertain whether immigrant families enjoy more protective family environment. First, two-parent family structure may not guarantee greater resources for children of immigrants because immigrant families tend to have single-earners with lower incomes (Capps, Fix, Ost, Reardon-Anderson, & Passel, 2005; Thomas, 2011). Second, union disruptions, while less common in immigrant families (Frank & Wildsmith, 2005; Phillips & Sweeney, 2006), may be more negative for immigrant children because of their stronger commitment to traditional family norms. Third, extended households are more vulnerable to structural instability (Richards, White, & Tsui, 1987; Van Hook & Glick, 2007). In the process of settlement,

immigrants often temporarily share the house with other relatives, thus children of immigrants experience more changes in their living arrangements than those of natives (Feliciano & Rumbaut, 2005; Van Hook & Glick, 2007). Given the negative effects of grandparent transitions (Dunifon & Kowaleski-Jones, 2007; Mollborn, Fomby, & Dennis, 2012), to what extent they affect immigrant children's cognitive development is unknown.

In this paper, we examine the impact of family household structures and their transitions experienced during childhood on children's cognitive development outcomes and how parental immigrant status moderate the effects of living arrangements. We distinguish the cognitive disparities between children across family and household structural compositions (between-child effects) and individual children's cognitive changes by family household structural transitions (within-child effects). We hypothesize positive associations with the presence of a second parent and extended adult, but negative associations with transitions of parental figures or extended members due to the stress from family instability. Further, we expect that the effects of family and household structures on cognitive scores will be moderated by parental nativity.

The immigrant paradox

Despite various challenges in navigating US school system and the language and cultural differences between home and school, children of immigrants do as well as children who were born in the U.S. to US-born parents (Crosnoe & Turley, 2011; Palacios, Guttmannova, & Chase-Lansdale, 2008; Perreira, Harris, & Lee, 2006; Portes & Rumbaut, 2001; Rong & Brown, 2001; Suárez-Orozco, Rhodes, & Milburn, 2009, p. 154). For example, Asian children of immigrants have higher reading and math scores than those of Asian natives as well as native white children, and children of African immigrants show higher reading scores than do the co-ethnic counterparts with US-born parents (Han, 2006; Palacios et al., 2008). Although the immigrant

advantage is stronger for Asian and African children than Hispanic children (Crosnoe & Turley, 2011), evidence is generally consistent with the immigrant paradox.

Family and household structures, transitions, and child development

Scholars suggest that the differences in family living arrangements between immigrant and native families may explain this apparent immigrant advantage (Crosnoe & Turley, 2011; Portes & Rumbaut, 2001; Suárez-Orozco et al., 2009). The prevalence of two-parent families and extended families among immigrants have been considered developmental advantages (Frank & Wildsmith, 2005; Landale et al. 2011: p. 46; Phillips & Sweeney, 2006). Further, some suggest that immigrant families receive more benefits from household members due to familism (Heard, 2007; Suárez-Orozco et al., 2009; Zeiders, Roosa, & Tein, 2011). None of the extant research, however, has directly examined the protective immigrant family hypothesis.

To test the protective immigrant family hypothesis, researchers should answer to what extent immigrant family compositions contribute to the cognitive advantage of immigrant children, relative to native families (between-child effects); to what extent family transitions contribute to the cognitive advantages for individual immigrant children (within-child effects), and; whether such family organizations are more beneficial for immigrant children than native children (moderation effects).

Family and household compositions: between-child effects

Family compositions consider the number of parents (e.g. single- vs. two-parents) and the presence of extended members in household (e.g. grandparents, aunts, and uncles). Family compositions are important determinants of access to resources and the nature of family interactions (Landale et al., 2011).

A long stream of research has highlighted the disadvantages of living with single parents due to the relative lack of social and economic resources. Children in two-parent families compared with those in single-parent families have shown better outcomes in various developmental indicators (Brown, 2004, 2006; Cherlin, 1999; Magnuson & Berger, 2009; McLanahan & Sandefur, 1994). Although findings for black native children are mixed (less negative than white vs. no racial difference; see Dunifon & Kowaleski-Jones 2002; Heard 2007; vs. Lee & McLanahan, 2015; Sun & Li, 2007), the positive effects of two-parent family structure on cognitive scores is largely consistent across racial and ethnic groups.

Extended members also can shape the amount and distribution of resources, although the associations between co-resident adults and children are less clear (Dunifon, 2013; Keene & Batson, 2010). On one hand, having multiple adult figures in the home can be positive for child development. Extended members, especially educated ones, may enhance a family's intellectual environment and promote children's cognitive skills (Zeng & Xie, 2014). Extended members can read to the children, help them with homework, and promote the importance of education and work ethics (Chen, Liu, & Mair, 2011; King & Elder, 1997). On the other hand, extended members may be negative for child development. Extended members who are disabled, ill, or lacking human and economic resources may distract time, money, and attention that could otherwise be used for the children (Leach, 2012). In addition, the relationships with extended members can be stressful for the family and the children (Choi & Marks, 2006; Cramer & McDonald, 1996; Guo, Xu, Liu, Mao, & Chi, 2016). The source of stress can be the unmet needs or the differences in beliefs and practices.

The associations between co-resident adults and children vary across racial and ethnic groups. In general, an extended household structure is more negative among white children than

among black children (Dunifon & Kowaleski-Jones, 2007; Dunifon 2012). For Hispanic children, researchers find no effects—either from grandparents or other relatives—on children's cognitive skills (Glick & Van Hook, 2008; Mollborn et al., 2011, 2012). Research is lacking on Asian children in the U.S. as most research focuses on parents or grandparents (Lunt, 2009; Treas & Mazumdar, 2004), but research conducted outside the US context suggests a positive effect of living with grandparents on children (Sonuga-Barke & Mistry, 2000; Zeng & Xie, 2014).

Family and household transitions: within-child effects

Family transitions consider the occurrence of family structural changes such as the entrance or exit of extended members as well as parental divorce, separation and a remarriage. The transitions of family household members have crucial impacts on child development. The entrance and exit of parents and other adults requires adjustments that can be stressful for the parent and the children; for a child, such changes can imply disruptions in the relationship with caregivers, which can have substantial consequences for her well-being (Crosnoe, Prickett, Smith, & Cavanagh, 2014).

Researchers have examined the dynamics of family structural effects on children, focusing on the consequences of changes in parent's union status (Fomby & Bosick, 2013; Fomby & Cherlin, 2007). Findings largely suggest that parental marital disruptions negatively affect children's cognitive development (Barrett & Turner, 2005; Brown, 2004, 2006; Magnuson & Berger, 2009). However, researchers also note that racial minority children, except for Asians, are less influenced by parental union status changes (Aughinbaugh, Pierret, & Rothstein, 2005; Fomby & Cherlin 2007; Lee & McLanahan, 2015; Sun & Li, 2007).

Despite having received little research attention, family transition involving extended members could be also disadvantageous (Rosenfeld, 2015). Extended households are more vulnerable to structural instability than any other households (Richards et al., 1987; Van Hook & Glick, 2007). Although some have suggested that a short-term residence of extended members may harm child development (Landale et al., 2011), little research has examined the association between the instability of co-residence with extended members and child development. A few findings support that the entrance or exit of grandparents are negatively associated with child development, but to a less extent among black and Hispanic children (Dunifon & Kowaleski-Jones, 2007; Glick & Van Hook, 2008; Mollborn et al., 2011, 2012). In other words, racial minority children may be more resilient to extended member transitions.

Moderating effects of parental nativity

As such, the majority of the literature focuses on children in native families; no research has examined the potentially different effects of living arrangements on immigrant children. Beyond the nativity difference in the living arrangements, parental nativity may moderate the family and household effects. Immigrants access different levels of economic resources but also follow distinct cultural practices from countries of origin (Dumka, Gonzales, Bonds, & Millsap, 2009; Fuligni, 1997). For example, parent-child relationship quality in Mexican American families was less influenced by family structure (Zeiders et al., 2011), which could be due to the strong familistic beliefs exhibited in Latino culture (Taylor, Conger, & Widaman, 2012). However, the differences are not always favorable for immigrant families.

Parental nativity & family and household compositions: between-child effects

Two-parent families may have less positive effects for children in immigrant families than those in native counterparts. Among immigrants, two-parent families tend to rely on a single

earner, largely due to the low labor force participation among immigrant women (Capp et al., 2005). This implies that even living with two parents, children of immigrants access lower levels of family incomes than do those of natives, explaining why immigrant families are less likely to use center-based child care (Brandon, 2004). Given the importance of quality center-based care for child cognitive development, it is unclear whether children of immigrants will benefit more from the two-parent family structure (Magnuson & Waldfogel, 2005).

The effects of co-residence with extended members may also differ by immigrant status. Some researchers have suggested that immigrant families' greater co-residence with extended kin may indicate their more supportive family behaviors (Heard, 2007; Suarez-Orozco, et al., 2009; Zeiders et al., 2011). However, co-residence with relatives is often motivated by economic reasons, and it does not necessarily translate into the positive and supportive relationship among members (Glick & Van Hook, 2008; Leach, 2012). For example, Salvadoran immigrants report the ambivalence of reciprocal exchanges among kin members due to their economic incapability and limited human capital (Menjívar, 2000).

Parental nativity & family and household transitions: within-child effects

Much less is known about the union formation or disruptions among immigrants and the extent to which such union status changes affect children of immigrants. The union dissolution is less common among immigrant populations (Frank & Wildsmith, 2005; Phillips & Sweeney, 2006). However, union disruptions can be more negative for some immigrant families, especially those from countries with lower levels of divorce (e.g. Jamaica, India). Although the family structural transitions are found equally disadvantageous for both natives and immigrants among Latinos (Glick & Van Hook, 2008), the pattern may not apply to other racial groups with different family norms and practices.

The transitions of extended members also need to be considered. Immigrant households often serve as a "port in a storm" (Van Hook & Glick, 2007, p. 229), in which recent migrants temporarily stay while they search for a job and housing. Accordingly, children of immigrants will experience more frequent changes in their living arrangements than those of non-immigrants. A few studies have examined the differential effects of co-residence with extended members by family immigrant status, and the findings are mixed. Glick and Van Hook (2008) find no significant difference in the effects of extended members on children's reading scores by parental nativity. Other researchers find that grandparent transitions are more disadvantageous for children of unauthorized Latinos than those of documented immigrants, although their research focuses on parental legal status (Kang, Cohen, & Chen, 2018). Because both studies focus on Hispanic children only (Glick & Van Hook, 2008; Kang et al., 2018), whether the transitions of grandparents will be more negative for children in other racial and immigrant groups is unknown.

Based on previous research (Dunifon & Kowaleski-Jones, 2007; Mollborn et al., 2011, 2012), we hypothesize: 1) Two-parent family structure will have positive effects on children's early cognitive development (between-child effects); 2) Co-residence with extended members will have positive effects on cognitive scores (between-child effects); 3) Both union status changes and extended member transitions will have negative effects on cognitive scores (within-child effects); 4) The effects of two-parent family structure on cognitive scores will differ by parental nativity; and 5) The effects of extended members will differ by parental nativity.

DATA

The ECLS–K is a longitudinal study consisting of a nationally representative sample of children from their kindergarten in the Fall of 2010-2011, who are being followed through the

elementary grades. The sample is collected by the U.S. Department of Education's National Center for Educational Statistics, with a multistage probability sample design. At each interview point, the parent—in most cases the mother, provided information about family background using computer-assisted telephone interviews. Details of the survey design, including eligibility and exclusion criteria and consent, are contained in Tourangeau et al.'s report (2017).

The sample for this study is restricted to children who participated in all four waves: in the fall and spring of kindergarten, the spring of first grade, and the spring of second grade. We excluded from analysis those children who are identified as Native Hawaiian or other Pacific Islander, American Indian or Alaska Native race, and multiracial (two or more races) due to the small number of cases. In addition, those cases where the race, ethnicity, and immigrant status variables are missing are dropped, resulting in an analytical sample of approximately 38,300 child-years. Of these, 57% are non-Hispanic White, 11% are non-Hispanic Black, 25% are Hispanic, and 8% are Asian.

Measures

Dependent Variable—Academic Achievement

Children's competence in reading (language and literacy) and mathematics were assessed in each wave. The reading assessment measures basic skills (e.g. word recognition), vocabulary knowledge, and reading comprehension. Reading comprehension covers children's proficiency in identifying information in text, making inferences within and across texts, and considering the text objectively in its appropriateness and quality (Tourangeau et al., 2017, p. 30). The mathematics test measures children's proficiency in conceptual and procedural knowledge and problem-solving skills. The assessment consisted of questions on number sense, properties, and operations; measurement; geometry and spatial sense; data analysis, statistics, and probability;

and patterns, algebra, and functions (p.30). This study uses Item Response Theory (IRT)-based standardized scores developed by the ECLS-K: 2011 for longitudinal measurement of gain in achievement. The scores provide a common scale of ability estimates across time. Test reliabilities were high – between .75 and .99 for all assessment points for reading and mathematics scores (Tourangeau et al., 2017).

Independent Variable—Family household Structures

Information about family and household structures was reported by parents of the child. Parents identified people who normally live in the household, excluding anyone staying temporarily who usually lives somewhere else. Family and household structures were measured every six months between the fall of 2010 and the spring of 2011. After 2011, family and household structures were measured once per year (every spring). For the fall of 2011 and 2012 (non-interview), children's living arrangement is coded as the same as that of the spring in the respective year. For instance, if a child was living with grandparents in the spring of 2011, that child is coded as living with grandparents in the fall of 2011.

Family structure variable indicates whether parents are married at the time of survey (0= currently married or in civil union, 1= divorced, separated, widowed, and never married). There was no significant difference in children's outcomes between those never married and previous married. Given the time-varying nature of union status, we measure: a) the average years parents are married over the survey period (mean) and b) the duration since the marital status changed (deviation). This mean-deviation method produces exactly the same results of the estimation for all the dummy variables of the extended members for each period for each child (Allison, 2005).

For household structure variables, we measure the types of extended members and a) the average years a child has lived with each type of extended member over the four survey

periods—Fall kindergarten, Spring kindergarten, Spring 1st year, and Spring 2nd year, and b) the duration since the extended member left. The types of extended members are measured based on the relationship with the focal child: grandparents and other relatives. Other relatives include aunts, uncles, or any members related through blood or marriage, other than grandparents.

Race and Parent's nativity

Race and immigrant status is represented by the following groups: white children with US-born or foreign-born parents, black children with US-born or foreign-born parents, Hispanic children with US-born or foreign-born parents, and Asian children with US-born or foreign-born parents. Children's race was measured by the parent's report or field staff during visits if parent responses about the child's race were missing. The race categories are mutually exclusive. Immigrant status was determined by the mother's response to the question of whether she was born in the United States. We did not separate children by their place of birth. A sample as young as this tends to include a majority of second-generation children than first-generation children (Lopéz & Radford, 2017). Moreover, those children who were born outside of the U.S. and migrated as a very young child and US-born children share the commonality of being socialized in the United States by foreign-born parents (Glick & Hohmann-Marriott, 2007).

Time-variant controls

Mother's employment status indicates whether she is employed at the time of survey (0=not in the labor force or unemployed, 1= employed). We measure mother's employment as a) the average years a mother was employed over the four survey periods and b) the duration since the mother left the labor force. Family poverty status is measured by the household's income-to-needs poverty variable (household income as a percentage of the 2001 federal poverty level, which adjusts for household size). Families living above the poverty line are coded as 0; those

living at or below 100-199 percent of the poverty line are coded as 1; and those below 200 percent of the poverty line are coded as 2.

Time-invariant controls

We measure the total number of parental marital status changes over the survey period to capture the instability of marital union. Mother's education level as an ordinal variable was created using the highest level of schooling of the mother. The information was obtained by the spring of kindergarten parent survey (0 = less than high school; 1= high school, 2 = vocational, some college, 3 = bachelor's degree or higher). A dichotomous variable was constructed using the information whether a child has ever attended center-based care the year before entering kindergarten (1=yes; 0=no). Child's sex is also measured as a dichotomous variable (1=boy; 0=girl), while age is a continuous variable measured in months.

Analytical strategy

Hybrid regression analyses will be used to examine the relationship between the composition and transitions of living arrangements and children's cognitive scores and to quantify the between-child (mean) and within-child effects (deviation) of family and household structures. The mean scores will estimate the between-child differences in cognitive scores by the various living arrangements. The deviation scores will estimate the within-child changes in the cognitive scores by the transitions of family and household structures. The difference in developmental outcomes among children by family structure refers to the between-child effects, and the change from the child-specific mean of the educational outcomes by the family structural changes refers to the within-child effects.

Hybrid regressions incorporate strengths of fixed- and random-effects regression analyses (Allison, 2005; Firebaugh, Warner, & Massoglia, 2013). Fixed effects model controls for *all*

time-invariant variables even if they were unobserved, therefore the model yields more accurate within-child effects of family living arrangements, but time-invariant variables such as parental immigrant status cannot be estimated in fixed effects model because only time-variant variables are estimated (Allison, 2005). Random effects models can estimate time-invariant controls and include a random term specific for each child to account for unobserved heterogeneity, based on the assumption that the random term is uncorrelated with the measured covariates of cognitive scores. Following Houle and Light (2014), we compared the fixed- and random-effects estimates and confirmed that the two approaches can be combined.

RESULTS

Table 1 presents the results of unweighted descriptive statistics for the variables. To begin with the outcome variables, except for Hispanic children, children of immigrants show similar or higher reading and math average scores over the period than those of natives. The apparent academic advantages are more pronounced for black children. Black children of immigrants score about 3.87 points higher on reading and 2.73 points higher on math tests than those of native black. Asian children of immigrants score about 1.38 points higher on reading scores, and about 0.21 points higher on math scores. On the other hand, Hispanic children of immigrants record about 4.41 points lower on reading tests and 3.79 points lower on math tests.

Table 2 shows the total average amount of time that children have spent in the various living arrangements, as well as the likelihood of experiencing any change in the living arrangements. There are some differences by parental nativity in the experience with the various family and household structures. In all racial groups, children of immigrants spend more time living in a two-parent family structure than those of co-ethnic natives. Children of immigrants in all racial groups spend more time living with other relatives (except for whites) but spend less

time living with grandparents (except for Asians). Asian immigrant children spend the longer average time with grandparents than those with US-born parents (0.51 years vs. 0.35 years). Regarding the stability of the extended households, children of immigrants are *less* likely to experience any change in family structures—by parental divorce, or (re)marriage, except for Hispanic children. Hispanic children of immigrants are more likely to experience union status changes than their co-ethnic counterparts (23% vs. 17%). Although children of immigrants are similarly or less likely to experience grandparent transitions, Asian children are more likely to experience such transitions.

Multivariate Results

Reading scores

Table 3 presents the results of regression analyses for reading scores. For white children, Model 1 shows that there is no statistically significant difference between native- and immigrant families, after controlling for family demographic characteristics. Model 2 separates the effects of the family household structures into the between- and within-child components. Regarding the between-child effects, compared with children who never lived in two-parent family structure, those who spent additional 6 months living with two parents have higher reading scores by 1.15 points ($p<.0001$). Compared with those who never lived with grandparents, children who spent additional 6 months living with grandparents show lower reading scores by about 1.4 points ($p<.0001$). Other relatives have negative but statistically not significant effects on reading scores. Regarding the within-child effects, parental union status changes do not significantly influence reading score changes (-0.208, not significant). Transitions of grandparents or other kin exert nearly no influence on reading score changes within a child. Model 3 shows that there is no significant interactional association between family structures and parental immigrant status.

For black children, having immigrant parents is associated with about 4.5 points higher on their reading scores (p<.001, Model 1). In Model 2, parental union status exerts significant between-child effects but no within-child effects on reading scores. Compared with children who never lived in two-parent family, those who spent additional six months with two parents show 3.1 points higher on the reading scores (p<.0001). Both between- and within-child effects of co-residence with grandparents are negligible and not statistically significant. Other relatives exert negative but not significant between-child effects. Model 3 shows that parental nativity moderates some between- and within-child effects. The transition of grandparents exert significantly more negative within-child effects for children of immigrants than those of natives by about 5.75 point (p <.05), although the difference in reading scores between native- and immigrant families, among those who have experienced grandparent transition does not exceed statistical significance (see Table 5).

For Hispanic children, those of immigrants show significantly lower reading scores by about 1.59 points (p<.0001) than those of natives (Model 1). Model 2 captures some significant family structural effects. Compared with children who never lived in two-parent family structure, those who spent additional 6 months living with two parents have higher reading scores by 2.5 points (p<.0001). Moving into or out of a two-parent family structure, however, does not significantly influence reading scores within a child. Model 3 shows that the within-child effects of parental union status changes is more negative for children of immigrants (-1.60, p <.05). Compared with those in native families having experienced marital disruption, the lower reading scores of children in immigrant families are statistically significant (-4.40= -2.80-1.60, p <.0001). There is almost no between- or within-child effects of extended members, regardless of parental nativity status.

For Asian children, those with immigrant parents show about 4.2 points higher on the reading score than those with US-born parents ($p<.001$). Parental union status shows no between- or within-child effects on the reading score (Model 2). However, grandparent transitions are significantly associated with lower reading scores within a child by about 2.63 points ($p<.05$), but there are no significant grandparent effects between children. As seen in Model 3, the within-child grandparent effects is significantly moderated by parental nativity (2.77, not sig), but the difference in reading scores between children from native- and immigrant families, among those who have experienced grandparent transitions, is statistically significant (10.95= 8.19+ 2.77, $p <.05$).

Math scores

Table 4 presents the results for math scores. For white children, there is no statistically significant difference between native- and immigrant families, after controlling for child and family demographics (Model 1). Similar to the results for reading scores, Model 2 shows that additional six months in a two-parent family structure is associated with higher math scores by about 1.9 points ($p<.0001$). Additional six months spent living with a grandparent is associated with lower math scores by about 3.8 points ($p<.0001$). Time spent with other relatives is also associated with lower math scores, but the association is statistically significant only at 10% ($p<.06$). None of the family and household structural transitions exert any influence on math scores within a child. Model 3 shows that there is no significant difference in the various family and household effects by parental immigrant status.

For black children, children of immigrants show significantly higher math scores than those of natives by about 3.6 points ($p<.0001$) in Model 1. Model 2 shows that additional six months living with two parents is associated with higher math scores by about 2.7 points

(p<.0001). Additional six months living with grandparents is associated with lower math scores by about 1.97 points than those who have never lived with grandparents (p<.05). Co-residence with other relatives is associated with a between-child difference of about 2.8 points in math scores, although the association does not obtain statistical significance (p<.10). Model 3 shows that the positive effects of living in a two-parent family are larger for children of immigrants than for those of natives (5.79, p <.05), but there is no difference in the extended member effects by parental nativity. The difference in math scores between native- and immigrant families in a two-parent family structure is statistically significant (3.66=5.79-2.13, p<.01).

For Hispanic children, Model 1 shows that those of immigrants show significantly lower math scores by about 1.26 points than those of natives (p<.01). In Model 2, additional six months living with two parents show higher math scores by about 2.9 points (p<.0001). Model 3 shows that while the within-child effects of parental union status are significantly moderated by parental nativity status (1.76, p<.05), and the math score difference between native- and immigrant families having experienced marital disruptions is statistically significant (=-1.99-1.76, p<.01). There are no significant between- or within-child effects of co-residence with other extended household members, regardless of parental nativity.

For Asian children, those with immigrant parents show significantly higher math scores than their counterparts with US-born parents by 2.68 points (p<.05). Parental union status does not appear to have any significant between- or within-child effects on math scores (Model 2). However, grandparent transitions are associated with a decline of 2.7 points in math scores within a child (p<.01). Model 3 shows that there is a significant difference in the within-child effects of co-residence with a grandparent by parental nativity (6.54, p<.05). The difference in

math scores between native- and immigrant families, among those who have experienced the change in co-residence with grandparents, is statistically significant (8.98=2.44+6.54, $p<.05$).

DISCUSSION & CONCLUSION

This research examines the effects of family and household living arrangements and their transitions on early childhood cognitive development and the moderation of such effects by parental immigrant status. As highlighted in Table 5, children of immigrants except for Hispanic children display higher cognitive scores than their co-ethnic counterpart with native parents. The result is consistent with the immigrant paradox literature. Using hybrid regression analyses, we examine the between- and within-child effects of the family and household structures on children's cognitive scores. Consistent with Hypothesis 1 (Brown, 2004; Carlson & Corcoran, 2001; Cherlin, 1999; McLanahan & Sandefur, 1994), we find that for all racial groups, except for Asians, the longer time spent living in two-parent family structure, the higher the children's cognitive scores. For Asian children, the positive between-child effects of a two-parent family structure are not statistically significant. Given the high likelihood of Asian children living with two parents (see Table 2), such a family structure may not play as an advantage.

Extended family living arrangements significantly influence children's cognitive development, but the influence depends on the types of extended family members and the race of the child. In contrast with Hypothesis 2, for white children, grandparents have negative between-child effects on both reading and math scores, as hypothesized and consistent with prior research (Dunifon & Kowaleski-Jones, 2007; Mollborn et al., 2012). Similarly, for black children, grandparents exert significantly negative between-child effects on math scores. For Asian and Hispanic children, grandparents exert no between-child effects. For Hispanic children, the null

finding is expected and consistent with previous findings (Glick & Van Hook, 2008; Mollborn et al., 2011, 2012).

Findings on family structural changes (within-child effects) are not consistent with Hypothesis 3. Although the disruption of parental union status exerts negative effects on children's cognitive scores, relationships are not statistically significant in all racial groups. As discussed in the section below, however, union disruptions have more negative effects on some immigrant children. On the other hand, grandparent transitions exert significant negative effects on cognitive scores for Asian children. The result of negative grandparent within-child effects is inconsistent with prior research emphasizing a positive role of grandparents on child development (e.g. Sonuga-Barke and Mistry 2000).

As expected in Hypothesis 4, parental nativity moderates the between- and within-child effects of family structures on child cognitive scores for some racial groups. Table 5 presents the summary of significant contrasts between native and immigrant families in our analytical results. For black children, the two-parent family structures have significantly more positive between-child effects for children of immigrants than those of natives. For Hispanic children, the within-child effects of parental union disruptions have more negative effects for immigrant families probably because they have experienced more disruptions than those of co-ethnic natives (see also Table 2). This finding for Hispanic children is inconsistent with previous research in which marital disruptions are equally disadvantageous for immigrant and native families (see Glick & Van Hook 2008). Given that Glick and Van Hook's research is based on the 1998 ECLS-Kindergarten cohort and the time elapsed since then, the inconsistency may result from period and cohort differences. Our finding indicates that newer Hispanic children of immigrants are facing greater risks of parental marital disruptions and the aftermaths.

Parental nativity moderates the within-child effects of extended members, consistent with Hypothesis 5. For Asian children, grandparent transitions are associated with decreases in math scores for those of natives only, not for children of immigrants (Table 5). How come grandparent transitions are more disadvantageous for Asian children of natives than those of immigrants? We first look at the characteristics of co-resident grandparents, such as education and health status (Leach 2012; Zeng & Xie 2014). Since the ECLS-K data do not collect the demographic information of extended members, we selected households with children aged 5 to 7 living with grandparents from the 2010-2012 pooled American Community Survey data which were comparable to the current sample (see Appendix). Although grandparents in immigrant families are more likely to be married than those in native families (56% vs. 38%), there is no difference in the likelihood of being disabled (both 30%).

Another possible explanation is related to interpersonal or intergenerational conflicts in Asian American families experiencing grandparent transitions (see Choi and Mark 2006). The relationships with grandparents may be more stressful for children in native families than those in immigrant families because US-born Asian parents may not be able to facilitate communication between their older parents and younger children unless they make extra efforts to communicate with them. Foreign-born Asians, on the other hand, may play this role better since they better understand their parents' culture of origins and can help the intergenerational interactions. In addition, there could be fewer conflicts over parenting practices in Asian immigrant families than in US-born Asian American families.

The current research is not free from limitations. Due to a small number of cases, diverse ethnic groups were collapsed into one racial group in this research, even when immigrants come from a variety of countries with varying patterns of living arrangements. For example, African

and Caribbean black immigrants have diverse family values and practices by national origins (Lincoln, Taylor, & Chatters, 2013; Taylor, Forysthe-Brown, Lincoln, & Chatters, 2017). Such diversity in family values and parenting, as well as access to socioeconomic resources, may have contributed to some of the variations in findings by racial groups. Future research should pay more attention to cultural/ethnic differences in examining the immigrant paradox in child development in general and the developmental (dis)advantageous associated with the various family and household structures in particular.

With that limitation in mind, the findings of the current research provide both a limited support for and a challenge to the immigrant paradox hypothesis. Consistent with previous research (Crosnoe & Turley, 2011), children of immigrants, especially black and Asian children, have higher cognitive scores than their co-ethnic counterparts with US-born parents, most likely benefiting from their living in two-parent families. The prevalence of and the greater stability of two-parent families among immigrants contribute to the cognitive advantages, especially for black children of immigrants. The same factor partly accounts for the disadvantage of Hispanic children of immigrants who are less likely to live in stable, two-parent families. However, co-residence with extended members among immigrant families does not always to be advantageous. Co-residence with grandparents in black immigrant families may actually be a disadvantage in child development, leading to declines in children's reading scores over time.

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Table 1. Unweighted Descriptive Statistics (Total N=33862)

	White Native		White immigrant		Black native		Black immigrant		Hispanic native		Hispanic immigrant		Asian native		Asian immigrant	
	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*
Reading	73.22	23.17	74.35	23.14	66.45	22.19	70.32	23.22	68.94	23.12	64.53	22.74	77.08	22.86	78.46	22.63
Math	58.27	22.99	58.09	23.06	47.56	20.87	50.29	21.49	52.31	22.60	48.52	22.55	61.06	22.67	61.27	22.64
# of family structure changes	.14	*.42*	.06	*.30*	.20	*.53*	.20	*.62*	.23	*.56*	.31	*.63*	.16	*.52*	.05	*.27*
Poverty (below 200%)	.11	*.31*	.10	*.30*	.43	*.49*	.45	*.50*	.31	*.46*	.58	*.49*	.07	*.25*	.15	*.35*
Poverty (100-199%)	.18	*.39*	.20	*.40*	.28	*.45*	.29	*.45*	.25	*.43*	.25	*.43*	.10	*.30*	.17	*.37*
Poverty (above 100%)	.71	*.46*	.70	*.46*	.29	*.46*	.26	*.44*	.44	*.50*	.17	*.37*	.84	*.37*	.69	*.46*
Less than high school	.04	*.18*	.05	*.22*	.08	*.28*	.18	*.39*	.14	*.35*	.47	*.50*	.02	*.13*	.07	*.26*
High school	.22	*.41*	.17	*.38*	.34	*.47*	.35	*.48*	.32	*.46*	.33	*.47*	.09	*.29*	.15	*.36*
Some college	.29	*.45*	.22	*.41*	.36	*.48*	.26	*.44*	.29	*.45*	.11	*.31*	.19	*.39*	.15	*.36*
≥ Bachelor	.46	*.50*	.56	*.50*	.22	*.41*	.21	*.41*	.26	*.44*	.09	*.29*	.70	*.46*	.63	*.48*
Mother's Employment	.70	*.46*	.58	*.49*	.70	*.46*	.68	*.47*	.63	*.48*	.47	*.50*	.73	*.44*	.65	*.48*
# of child in HH	2.47	*1.02*	2.36	*1.14*	2.60	*1.26*	3.00	*1.59*	2.65	*1.17*	2.82	*1.28*	2.39	*.99*	2.27	*1.01*
child sex	.52	*.50*	.50	*.50*	.53	*.50*	.44	*.50*	.52	*.50*	.51	*.50*	.40	*.49*	.45	*.50*
child age(mo)	67.97	*4.43*	67.01	*4.29*	67.45	*4.40*	66.66	*3.89*	67.04	*4.21*	66.66	*4.18*	67.43	*4.66*	66.06	*4.27*
Center care	.60	*.49*	.60	*.49*	.52	*.50*	.44	*.50*	.54	*.50*	.49	*.50*	.55	*.50*	.57	*.50*
% of Sample	56.66		2.81		10.18		1.18		10.23		12.23		1.14		5.58	
N	19651		985		3532		409		3582		4287		408		1986	

Note: Source is Early Childhood Longitudinal Study—2011 Kindergarten cohort children aged 5 – 8 years between 2011 and 2013.

Table 2. Living Arrangements for Children across Racial and Immigrant groups

	Native white		White immigrant		Black native		Black immigrant		Hispanic native		Hispanic immigrant		Asian native		Asian immigrant	
	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*	Mean	*S.D*
Total years in Two-parent family [a]	2.37	*1.05*	2.63	*.77*	1.04	*1.28*	2.08	*1.17*	1.89	*1.25*	2.00	*1.19*	2.55	*.92*	2.65	*.75*
Total years with Grandparents [a]	.20	*.68*	.16	*.57*	.47	*.97*	.40	*.92*	.51	*1.03*	.32	*.85*	.35	*.89*	.51	*1.03*
Total years with Other relatives [a]	.06	*.33*	.04	*.26*	.16	*.58*	.35	*.80*	.13	*.50*	.30	*.77*	.03	*.23*	.14	*.56*
Ever experienced Family structure Transitions (%)	.11		.05		.15		.11		.17		.23		.11		.04	
Ever experienced Grandparent Transitions (%)	.06		.06		.13		.11		.11		.07		.08		.11	
Ever experienced Other relative Transitions (%)	.03		.02		.07		.15		.07		.11		.02		.05	

Note: [a] : the unit of time is adjusted for descriptive purpose (from 6 months to one year).

Table 3. Results of Hybrid Regression Analyses for Reading Scores (With Control Variables)

	White			Black			Hispanic			Asian		
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
Immigrant parents (ref. native)	1.00	.76	- .12	4.54***	3.48**	- .30**	-1.59***	-1.87**	-2.80**	4.20**	4.27**	8.19
(S.D.)	*(.64)*	*(.64)*	*(2.50)*	*(.98)*	*(1.02)*	*(2.35)*	*(.49)*	*(.49)*	*(.96)*	*(1.31)*	*(1.32)*	*(4.40)*
Two-parent family												
Btw-child (M)		1.15***	2.26***		3.09***	2.64**		2.51***	1.74*		.29	3.66
		(.22)	*(.45)*		*(.74)*	*(.77)*		*(.57)*	*(.80)*		*(2.05)*	*(4.11)*
Within-child (D)		- .21	- .40		.53	.53		- .35	.62		.31	.70
		(.16)	*(.32)*		*(.62)*	*(.65)*		*(.39)*	*(.62)*		*(1.50)*	*(2.46)*
Grandparents												
Btw-child (M)		-1.38***	-2.84***		- .57	- .81		.08	.34		-2.33	-2.54
		(.32)	*(.65)*		*(.99)*	*(1.04)*		*(.74)*	*(1.00)*		*(1.49)*	*(4.08)*
Within-child (D)		.03	- .06		.17	.76		- .79	- .23		-2.63*	-5.01
		(.24)	*(.50)*		*(.81)*	*(.85)*		*(.69)*	*(.93)*		*(1.11)*	*(3.20)*
Other relatives												
Btw-child (M)		- .97	-1.65		-2.03	-1.69		1.40	.65		1.92	6.30
		(.62)	*(1.25)*		*(1.51)*	*(1.65)*		*(1.03)*	*(2.02)*		*(2.81)*	*(14.47)*
Within-child (D)		- .14	- .10		.874	.31		.42	.68		-1.57	-5.22
		(.32)	*(.64)*		*(.97)*	*(1.11)*		*(.62)*	*(1.1)*		*(1.64)*	*(6.45)*
Immigrant* Two-parent (M)			.96			4.90			1.48			-4.47
			(2.61)			*(2.50)*			*(1.09)*			*(4.59)*
Immigrant* Two-parent (D)			- .92			- .88			-1.60*			- .82
			(2.16)			*(2.22)*			*(.80)*			*(3.11)*
Immigrant* Grandparent (M)			2.40			2.33			- .68			.25
			(3.57)			*(3.40)*			*(1.49)*			*(4.37)*
Immigrant* Grandparent (D)			1.83			-5.75*			-1.28			2.77
			(2.09)			*(2.70)*			*(1.39)*			*(3.41)*
Immigrant* Other relative (M)			-9.49			- .02			.99			-4.43
			(7.06)			*(4.18)*			*(2.34)*			*(14.77)*
Immigrant* Other relative (D)			-6.13			1.66			- .35			3.96
			(3.80)			*(2.35)*			*(1.32)*			*(6.670)*
Intercept	17.95***	17.19***	17.26***	12.54*	11.07*	11.33*	18.39***	16.85***	17.12***	16.32*	15.66*	13.09
	(2.25)	*(2.27)*	*(2.27)*	*(4.84)*	*(4.84)*	*(4.84)*	*(3.596)*	*(3.61)*	*(3.63)*	*(7.754)*	*(7.97)*	*(8.58)*
R^2	.744	.746	.746	.725	.730	.730	.728	.729	.730	.668	.671	.671

Note: † p <.10. *p < .05. **p < .01. ***p < .001

Table 4. Results of Hybrid Regression Analyses for Math Scores (With Control Variables)

	White			Black			Hispanic			Asian		
	M1	M2	M3	M1	M2	M3	M1	M2	M3	M1	M2	M3
Immigrant parents (ref. native)	- .21	- .43	-1.10	3.64***	2.73**	-2.13	-1.26**	-1.57**	-1.99*	2.68*	2.64*	2.44
(S.D.)	*(.13)*	*(.13)*	*(.13)*	*(.95)*	*(.99)*	*(2.28)*	*(.48)*	*(.49)*	*(.95)*	*(1.14)*	*(1.15)*	*(3.83)*
Two-parent family												
Btw-child (M)		1.94***	1.90***		2.69***	2.17**		2.92***	2.59**		1.57	1.30
		(.44)	*(.44)*		*(.72)*	*(.75)*		*(.56)*	*(.79)*		*(1.78)*	*(3.57)*
Within-child (D)		- .25	- .20		- .27	- .10		- .39	.69		.50	1.01
		(.280)	*(.28)*		*(.54)*	*(.57)*		*(.36)*	*(.57)*		*(1.22)*	*(1.99)*
Grandparents												
Btw-child (M)		-3.82***	-3.96***		-1.97*	-2.41*		- .32	- .50		-2.19	-2.360
		(.64)	*(.65)*		*(.97)*	*(1.01)*		*(.73)*	*(.99)*		*(1.30)*	*(3.55)*
Within-child (D)		.35	.17		.46	.49		.67	.82		-2.71**	-8.43***
		(.43)	*(.45)*		*(.71)*	*(.75)*		*(.63)*	*(.85)*		*(.90)*	*(2.58)*
Other relatives												
Btw-child (M)		-2.31	-2.14		-2.76	-2.66		.59	1.48		2.84	2.90
		(1.22)	*(1.24)*		*(1.48)*	*(1.61)*		*(1.02)*	*(2.00)*		*(2.45)*	*(12.58)*
Within-child (D)		.25	.43		.47	.66		.14	1.07		.02	-1.07
		(.56)	*(.57)*		*(.86)*	*(.97)*		*(.57)*	*(1.00)*		*(1.34)*	*(5.23)*
Immigrant* Two-parent (M)			.59			5.79*			.66			.16
			(2.59)			*(2.48)*			*(1.07)*			*(3.99)*
Immigrant* Two-parent (D)			-2.60			-1.99			-1.76*			-1.06
			(1.92)			*(1.94)*			*(.73)*			*(2.52)*
Immigrant*Grandparent (M)			4.12			4.89			.38			.21
			(3.55)			*(3.32)*			*(1.47)*			*(3.81)*
Immigrant* Grandparent (D)			3.03			- .52			- .29			6.54*
			(1.87)			*(2.37)*			*(1.26)*			*(2.75)*
Immigrant* Other relative (M)			-6.48			1.51			-1.20			- .04
			(7.03)			*(4.07)*			*(2.32)*			*(12.84)*
Immigrant* Other relative (D)			-5.84			- .73			-1.36			1.32
			(3.39)			*(2.06)*			*(1.20)*			*(5.41)*
Intercept	-7.57**	-7.85**	-7.75**	-11.89*	-13.04**	-12.96**	-7.56*	-9.26*	-9.08*	- .207	-2.13	-1.81
	(2.25)	*(2.26)*	*(2.26)*	*(4.71)*	*(4.71)*	*(4.70)*	*(3.56)*	*(3.58)*	*(3.60)*	*(6.75)*	*(6.93)*	*(7.47)*
R^2	.753	.755	.755	.710	.715	.716	.733	.735	.735	.741	.743	.744

Note: † p <.10. *p < .05. **p < .01. ***p < .001

Table 5. Summary of Significant Contrast in Analytical Results

	Reading				Math			
	White	Black	Hispanic	Asian	White	Black	Hispanic	Asian
Cognitive score Difference	.	Imm>Nat	Imm<Nat	Imm>Nat	.	Imm>Nat	Imm<Nat	Imm>Nat
Two-parent (btw-child)	.	Imm (+) > Nat (+)	.	.	.	Imm (+) > Nat (+)	.	.
(within-child)	.	.	Imm (-) < Nat (n.s.)	.	.	.	Imm (-) < Nat (n.s.)	.
Grandparent (btw-child)	.	.	.	.	.	.	.	.
(within-child)			.	Imm (n.s.) > Nat (n.s.)	.	.	.	Imm (n.s.) > Nat (-)

Note: All estimates involving interaction terms are calculated with the combined coefficients in Model 3. All differences between native- and immigrant families are statistically significant at $p<.05$ level (e.g. For Asian children, the within-child effects of grandparent transitions on reading scores is *not significant* for both native- and immigrant families. However, the difference in reading scores between native- and immigrant families, among those who have experienced grandparent transitions, is statistically significant).