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Program participation of immigrant children: Evidence from the local availability of Head Start

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ABSTRACT

This paper analyzes the impact of the local availability of Head Start, a public preschool program for low-income children, on the participation of immigrant children. We use propensity score methods to flexibly control for numerous individual and neighborhood characteristics and availability of other services aimed at low-income families. We find that having a Head Start center in a child's census tract significantly raises participation of immigrant children, and these results are robust to several sensitivity analyses. Furthermore, the impacts are larger for recent migrants and for those with less access to private transportation, consistent with both information and transportation costs as important factors affecting program participation for immigrants.

1. Introduction

This paper examines the impact of local availability of Head Start, a public preschool program for disadvantaged children, on participation by immigrant children.[1] Immigrant children are the fastest growing segment of the child population, currently making up 20% of all school-age children in the United States. Although a diverse group, they tend to come from families of lower socio-economic status where English is not regularly spoken, putting these children at greater risk of falling behind in school. The demonstrated benefits from early childhood education programs, such as Head Start,[2] may be particularly beneficial to immigrant children because they advance skills at a key period of language, social, emotional and cognitive development (Shonkoff & Phillips, 2000).

Yet, immigrant children are less likely than their native peers to be enrolled in Head Start and other early childhood education programs and are instead more likely to be in exclusive parental care or informal child care.[3] One explanation for this pattern could be that immigrant fam-

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[1] We define a child as an immigrant if the child was born outside of the United States or if either parent was born outside of the United States. Although we are combining 1st and 2nd generation children, the vast majority of our sample is 2nd generation children, reflecting the fact that they are young children mainly born in the United States.

[2] For evidence on the effects of Head Start on children regardless of immigrant status, see Currie and Thomas (1995), Puma, Bell, Cook, Heid, and Lopez (2005), Garces, Thomas, and Currie (2002), and Ludwig and Miller (2007). The evidence on Head Start is reviewed in Barnett (2007), Besharov and Higney (2007), and Currie (2007). For a review of evidence on other early childhood education programs, see Currie (2001) and Gormley (2007); see also Wong, Cook, Barnett, and Jung (2008) for recent evidence on pre-kindergarten programs. For specific evidence on the impact of Head Start for Hispanic children, see Currie and Thomas (1999).

[3] Magnuson, Lahaie, and Waldfogel (2006) report that 46% of children of immigrants, regardless of HS eligibility, were enrolled in a school or center-based preschool program and 29% were in exclusive parental care the year before kindergarten, as compared to 63% and 16%, respectively, for native-born children. See also Crosnoe (2007).

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ilies are less aware of the availability of Head Start or face greater transportation burdens in accessing programs for their children, so having a Head Start center nearby may facilitate enrollment. Understanding the factors that affect participation is essential for the design of policy measures to increase their participation.

In addition to examining the net impact of local availability of Head Start, we also focus on exploring the role of information and transportation costs in affecting participation. Understanding the role of information contributes to the broader literature on immigrant participation in social programs (Bertrand, Luttmer, & Mullainathan, 2000; Borjas & Hilton, 1996; Borjas & Trejo, 1991). Evidence indicates participation in several public programs increases as immigrants spend more time in the country. This suggests information about availability outweighs the increased earnings experienced by immigrants, but there is little empirical evidence to test this particular mechanism. If recent immigrants are less informed about Head Start than older immigrants and local availability affects participation by providing information, then having a center nearby will have a larger impact on recent immigrants.

The importance of transportation costs is underscored by recent changes in Head Start regulations that require greater efforts to provide transportation to children. Although the mandates aim to increase enrollment, we are unaware of any systematic evidence to indicate whether transportation affects enrollment. If local availability affects enrollment by reducing transportation burdens, then we can test for the importance of transportation costs by estimating whether having a center nearby has a larger impact for those who do not own vehicles and instead use public transit.

To test these predictions, we use data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K), a nationally representative sample of children in kindergarten that includes a large sample of immigrant children. The survey collects extensive information about the children including family characteristics and Head Start enrollment. We use a non-public version of the ECLS-K that contains the census tract of residence of each child, which we use to merge data on the location of every Head Start center, to estimate the impact from having a Head Start center in the child's census tract of residence.

Head Start centers may locate selectively, however, so that the characteristics of areas with centers differ from areas without centers, such as their peer composition and availability of other services aimed at low-income children. These factors may have an important influence on participation (e.g., Bertrand et al., 2000), so failure to properly account for them may yield spurious estimates. To account for these factors, we merge numerous census tract level demographic variables from the decennial census, local availability of other public services from the National Center for Charitable Statistics (NCCS), and local availability of individual religious organizations from several of the top denominations. We also use propensity score methods to control flexibly for all covariates, and find this method balances the distribution of baseline characteristics across those with and without Head Start centers nearby.

Our findings indicate that ordinary least squares (OLS) estimates decline almost monotonically as we add more covariates to our model, raising the potential concern of omitted variable bias. Our propensity score estimates, however, are generally insensitive to further controls, and indicate that having a Head Start center in the census tract is associated with a statistically significant increase in enrollment for immigrant children of roughly 10 percentage points. Local availability has the largest impact on recently migrated families, consistent with the hypothesis that information plays an important role. We also find that having a local Head Start center has a bigger impact on families living in census tracts with low vehicle ownership and high use of public transit, suggesting the importance of transportation in affecting take-up. These results suggest greater promotion of and easier access to services may increase take-up of Head Start and other government services and programs for immigrant children.

2. Background

2.1. Information on Head Start[4]

In this section, we highlight aspects of Head Start (HS) relevant to our analysis. Head Start is a federal-local matching program whereby local grantees apply to the Department of Health and Human Services (DHHS) for funding. Grants are issued on a 3-year cycle, but incumbents have priority when re-applying. For example, if an incumbent grantee's application is rejected, they are automatically given the right to appeal. Because of this preference for incumbents, many Head Start centers have been in the same location for several years.

A unique aspect of Head Start relative to numerous other federal programs aimed at low-income individuals is that Head Start is funded by appropriation: when funding runs out, eligible children cannot enroll.[5] Therefore, Head Start centers often face an excess demand for services and are required to select amongst the eligible to fill the number of spaces allotted by their grant. For non-selected children, centers provide a ranked waitlist, and allow children to enroll as current enrollees leave and spaces become available. Because of this excess demand, a child's regular attendance is essential for preserving a space in the center. There are two additional restrictions mandated for enrollment: at least 10% of enrolled children in centers must have special needs, such as being developmentally delayed or physically abused, and no more than 10% of enrollees can be income ineligible, such as special needs children or children from foster families.[6]

Centers must serve children in their "catchment" area. Catchment areas are approved by DHHS and typically consist of one or more government defined geographic areas, such as a census tract. Like school districts, they are not

[4] All background information comes from the Head Start performance standards from the Code of Federal Regulations (2001) and from personal visits with several Head Start centers in northern Manhattan.

[5] Allocation to states is based on the number of eligible children.

[6] Despite this official restriction, there are some concerns as to whether it is implemented by all centers (Besharov and Morrow, 2007).

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intended to overlap with other catchment areas served by other centers. They are designed to reduce the transportation burden of families, so children must attend the Head Start center in their catchment area.[7] This setup suggests that children go to the Head Start center in their census tract, if one exists, and not necessarily to the center that is the closest physical distance.

Centers also may provide transportation for attendees, and the amount of transportation services offered greatly changed in 2001. Prior to 2001, centers needed a disability service plan that included round trip transportation to the center for disabled children if the lack of transportation would prevent participation. Beginning in 2001, regulations were updated to require that agencies assist "as many families as possible" if lack of transportation affected participation, with a 5-year timeframe given to meet the specific requirements of the plan. This change in regulations reflects the importance of transportation costs in affecting take-up.

To attract participants, Head Start centers are required to make efforts to notify every eligible child in their catchment area by performing such tasks as door-to-door canvassing and advertising at local fairs and churches. This suggests that not all eligible families are aware of Head Start, so presence of a center may influence demand for Head Start.

In addition to centers recruiting participants, another primary source of enrollees is from referrals. Referrals may be either by word of mouth or through other agencies, such as Women, Infants, and Children (WIC) and health clinics, though Head Start often serves as a gateway to other services. Because of this potential link with other agencies, it is important for us to account for the availability of other social services for eligible children.

2.2. Background information on program participation

We review several strands of literature relevant to our analysis. We point out that HS differs from other programs because (1) children are selected into Head Start because it is funded by appropriation and (2) families use HS services on a regular basis—often once a day, which requires two daily trips to the HS center—and other services may not require such frequent interactions. Therefore, it is not entirely clear how others' findings generalize to Head Start (or how our findings generalize to other programs).

2.2.1. General evidence on program participation

Stigma, an undesirable classification arising from participating in a program limited to the low-income, has been extensively studied and shown to be an important deterrent to participation in welfare programs such as AFDC/TANF and Food Stamps (see e.g. Moffitt, 1983; Rainwater, 1982). However, stigma appears to be less important as a deterrent in service-oriented programs such as health insurance (Remler & Glied, 2003).

Information appears to play a prominent role in affecting take-up. An experimental study found that the direct provision of information about benefits and eligibility increased Food Stamp applications (Daponte, Sanders, & Taylor, 1999). Aizer (2003, 2007) examined the role of outreach in boosting participation in Medicaid, and found that advertising (in both English and Spanish) and bilingual assistance had a substantial impact on the enrollment of Hispanic and Asian children, groups likely to possess limited information because they are immigrants with limited English speaking ability.[8] Studies of take-up of housing vouchers suggest that members of racial/ethnic minority groups are less likely to use vouchers and move to a new neighborhood when they are less comfortable with Whites and when their own group makes up a smaller share of the population (see e.g. Shroder, 2001).

One important source of information may come from social networks. Bertrand et al. (2000) found that social networks, as defined by proximity to use of services by others in the same language group, had a substantial impact on welfare participation. Aizer and Currie (2004) also found that networks played an important role in the use of prenatal services, but their estimates support the role of institutional barriers rather than information about program availability or eligibility.

With respect to programs for children, in a study of the Women, Infants, and Children (WIC) nutrition program for pregnant and post-partum women and young children, Bitler, Currie, and Scholz (2003) found that more stringent WIC program rules played a role in explaining the variation in participation in this program, suggesting that transaction costs are a factor. However, they found little evidence that having more WIC agencies per capita affected participation, though this aggregate measure of availability differs considerably from our measure of local availability.

2.2.2. Evidence on program participation for immigrants

Several studies have exclusively focused on the take-up of social programs by immigrants (e.g., Borjas & Hilton, 1996; Borjas & Trejo, 1991). These studies generally found that use of services increased with more recent immigrant cohorts and time spent in the country. The latter finding has stimulated speculation about why assimilation increases take-up. On the one hand, assimilation increases wages, so it should decrease eligibility and reliance on social programs. On the other hand, assimilation reduces legal barriers and increases information about programs. Borjas and Hilton (1996) found little evidence to support legal barriers, but found a strong influence from types of programs received by earlier cohorts, suggesting network effects. This finding, combined with that from Bertrand et al. (2000), hints that the role of information may be an important factor, but there is no direct evidence to support this claim.

[7] This rule recently changed so that children are now permitted to go to centers in the catchment area where their parents work.

[8] Qualitative studies of Medicaid participation confirm that immigrants are deterred by lack of knowledge, lack of facility in English, and concerns about immigration status (see Perry, Stark, & Valdez, 1998).

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3. Data

We primarily use the Early Childhood Longitudinal Study-Kindergarten Class of 1998–1999 (ECLS-K), a nationally representative sample of approximately 22,000 kindergarteners with a sizeable sample of immigrant children. The ECLS-K contains detailed information on background characteristics of children and their family, including immigration status, as well as questions about Head Start enrollment. In addition, the geocoded version of the ECLS-K contains the census tract of residence of each child, which we use to merge data on Head Start centers and other services and census tract level variables. To maintain sample size, we impute all missing variables except for HS attendance and local availability of HS using multiple imputation by chained equations (van Buuren, Brand, Groothuis-Oudshoorn, & Rubin, 2006).[9] Out of 1742 eligible immigrant children with a reported census tract who were in kindergarten for the first time in the base year survey, 123 had information on HS missing, leaving a final sample of 1619 eligible immigrant children.

3.1. Head Start enrollment

This data set contains a large number of children who enrolled in Head Start prior to kindergarten, making it so rich for this type of analysis that the federal agency administering Head Start considers the ECLS-K a "Head Start sub-study".[10] Information on Head Start enrollment is obtained from retrospective questions of the parents. If parents indicated the child had received care outside of the home, parents were then asked if the child had attended Head Start. Furthermore, the name and location of the center were recorded, with a directory of centers available to assist the parent. The named center was then contacted to verify enrollment, but centers were only contacted if the respondent indicated their child participated in HS, so this is not an independent source of HS enrollment. In our final sample of 1619 eligible immigrant children, 385 parents responded that their child attended Head Start, with enrollment verified for 188. We primarily use the retrospective data reported by parents for determining enrollment to maintain consistency with previous studies of participation that use self-reports, though we also use verified enrollment as a robustness check.

3.2. Immigration status

Parents are asked in several waves about their own country of origin and whether their child was born in the United States. We define a child as an immigrant if the child was born outside of the United States or if either parent was born outside of the United States. Of parents born outside the United States, nearly two-thirds are Hispanic and 16% are Asian. Since less than 200 children are first generation immigrants in the ECLS-K, we pool first and second generation immigrants to maintain an adequate sample size for inference, and include a dummy variable to indicate first generation. The ECLS-K also records when migration took place, and we use the year of child's migration, mother's year of migration if the child was born in the United States, and finally father's year of migration if both are missing.

3.3. Control variables

The ECLS-K contains extensive data on family and child characteristics associated with program participation. We include in our econometric models controls for the mother's employment status currently and at the period surrounding birth, educational attainment, and age she gave birth. To control for the child's background characteristics, we use gender, race/ethnicity, and an indicator for low birth weight. For household characteristics, we use income, poverty status, number of siblings, presence of father in household and his employment status, central city or suburban residence, and the number of grandparents the child has a close relationship with. We also control for whether anyone in the family participates in WIC, AFDC, or food stamps to account for familiarity and comfort with use of public services.

3.4. Head Start availability

We obtained data on the street address of Head Start centers as of 2006 from the Administration for Children and Families.[11] Since children in the ECLS-K would have attended HS in 1997 and centers are not necessarily in the same location for the time period we study, this yields measurement error in local availability. However, the grant writing process for obtaining funding for Head Start gives incumbents preferential treatment, suggesting strong path dependence of centers, and any measurement error would likely bias estimates towards zero (Kane, Rouse, & Staiger, 1999).

In order to determine local availability of Head Start for each child from the ECLS-K, we create an indicator variable for whether a center is located in the child's census tract of residence. We obtained the geographic coordinates, including the census tract, of the centers using EZ-Locate geocoding services.[12] Given that children must attend the Head Start center in their catchment area, the center in their census tract is likely to be the source of information about Head Start services.

3.5. Neighborhood characteristics

We use the child's census tract of residence to merge various area demographics. Using the 2000 Census of

[9] We choose not to impute these two variables because they do not appear to be missing at random, a necessary assumption for imputation to yield unbiased estimates. Furthermore, because we do not impute whether a HS center is in a census tract, we perform single rather than multiple imputation. Standard errors for local availability will be valid, but standard errors for the imputed covariates will be understated (Allison, 2002).

[10] See http://www.acf.dhhs.gov/programs/core/ongoing_research/hs/hs.html.

[11] Information on location of centers in 1997 was unavailable.

[12] The geocoding services are available at http://www.geocode.com/.

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Population and Housing, we merge census tract level median income, fraction below poverty, fraction using public assistance, median housing and rental prices, population density, race and age distributions, mean education, percent foreign born and linguistically isolated, percent participating in the labor force, and percent married. We do not have individual level data on mode of transportation, so we instead use the percent of homes with zero cars, percent with one car, and percent that typically use public transportation for work.

Since peer enrollment in HS may directly impact participation, we also would like to control for local enrollment rates in HS, but do not possess such data at the census tract level. Instead, we compute county level enrollment rates using an administrative file from Administration for Children and Families (ACF) on total enrollment by county as of 2000 divided by the number of 3- and 4-year-old children in poverty data from the 2000 census (constraining it to be less than or equal to 1). This gives a measure of the percent of eligible children in the county enrolled in HS. Peer enrollment may capture some of the impacts of local availability, so we separately add this variable to our model to assess the degree to which this occurs, and find this has little impact in our preferred specification.

3.6. Availability of other services

Our data on local services consists of non-profit services aimed at low-income families and churches. The data on non-profit services come from the 2000 National Center for Charitable Statistics (NCCS) Business Master File. This dataset contains the universe of all tax-exempt organizations with 501c3 and 501c4 status filed with the Internal Revenue Service (IRS). The file contains the physical address of the organizations, along with the IRS activity code that describes the type of service the non-profit offered. We use the exempt status ruling date to define services available in 1997, the year the ECLS-K cohort would have likely attended Head Start. As with assigning Head Start centers, we obtained the census tract using the physical address. To define services relevant for Head Start eligible families, we separately created dummy variables for the availability of health clinics, mental health clinics, child abuse programs, services to the poor, recreation facilities, community centers, and boys and girls clubs at the census tract.[13]

Since churches often play a strong role in people's lives (e.g., Dehejia, De Leire, Luttmer, & Mitchell, 2007; Gruber, 2005), we also merge information on the locations of churches. We obtained the physical address of every church for 4 of the 10 most popular denominations: the Catholic Church (#1), Methodist Church (#3), Presbyterian Church (#5), and Church of Christ (#10) (Church Growth Research Center, 1990). Data on the location comes from directory listings obtained by directly contacting administrative offices of each church.[14] We also geocoded the addresses and created a dummy variable to indicate presence in a census tract. The church listings are as of 2005, so there is also a possibility of measurement error in assigning the number of churches, though we have no reason to expect this measurement error is correlated with the location of Head Start centers.[15]

We were unable to obtain information on the location of offices providing government services, such as welfare, food stamps, and child protective services (CPS). We do not think this is a concern because we observe enrollment in several federal programs in the ECLS-K, so we directly control for it in our regressions. Furthermore, for the government services we do not observe, many of them contract out services to non-profit agencies, and we are already accounting for the location of non-profit agencies. For example, CPS has a mandate to find a child and investigate abuse/neglect regardless of distance to child. Once the case has been investigated or if CPS declines to investigate because the case appears low risk, they rely heavily on non-profit neighborhood based services to provide support to the family (Waldfogel, 1998).

Since HS may serve as a gateway to these other services, rather than vice versa, accounting for these other services may over-control for variables in our model. Therefore, we estimate models both with and without these other services to assess the sensitivity of our estimates, and find they make little difference in our preferred specification.

3.7. Defining eligibility for Head Start

In our analysis we focus only on children potentially eligible for Head Start because ineligible children may differ from eligible children in many ways. We define eligibility by including a child if the family is below the poverty threshold in any survey wave or if the mother or child used WIC during pregnancy or after birth. Of children that went to Head Start, only 7.8% are defined as ineligible, which is expected because, as previously mentioned, Head Start can enroll income ineligible children with special needs or in foster homes. Therefore, although we unintentionally leave out some eligible children using this definition, we capture the bulk of Head Start children. To the extent these exclusions may bias our estimates if foster and special needs children respond differently to center location, we can interpret our estimates as the impact of HS availability for children who are eligible solely because of income.

4. Conceptual framework and empirical strategy

An economic model of program participation (Moffitt, 1983) suggests that individuals will participate in a program when the benefits of doing so exceed the costs. Thus,

[13] We use IRS activity code 154 for health clinics, 166 for mental health clinics, 560 for services for the poor, 327 for child abuse clinics, 321 for boys and girls clubs 296 for community centers, and 297 for recreation facilities.

[14] We contacted the other six denominations, but none would release the addresses of their individual churches.

[15] Some of the non-profits or churches could also be HS providers, so including these variables could dampen the impact of HS availability on participation. To assess if this is a significant problem, we also estimate models without these variables, and find it makes little difference in our estimates.

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all else equal, eligible individuals are more likely to participate in a program when benefit levels are higher and less likely to participate when costs are higher.[16] Alternatives to HS include other state-based public preschools, private preschool, informal care, and parental care. Since we do not have details on the availability and quality of alternative child care options (the benefits), we focus primarily on the impact of costs on participation, concentrating on transportation costs and information.[17]

Transportation costs may be particularly important for affecting participation in HS since the child travels to the center on a daily basis and low attendance is grounds for dismissal from a HS program. If there is alternative care closer to home than the closest HS center, parents may rationally not choose HS because the additional transportation costs exceed the additional benefits from going to HS. Therefore, having a center close to home reduces transportation costs and increases the probability of using HS. Furthermore, individuals who use public transit (own a car) may find it more (less) difficult to travel to a center than those who drive, so having a center nearby should have a larger (smaller) impact on participation for those who use public transit (own a car).[18]

Information costs (i.e. the lack of knowledge about the program or about one's eligibility) have also been found to deter participation. Since Head Start has existed for over 40 years, it seems unlikely that longstanding resident groups are unaware of it, especially given the strong intergenerational correlations in poverty. Immigrants, however, are less likely to be aware of social programs because of lack of familiarity with existing services or communication barriers, so having a center close by should increase their awareness (through recruitment efforts) and therefore participation. We also expect immigrants who migrated most recently to have the least knowledge about Head Start, so having a center close by should have a larger impact for newer migrants.[19]

Our goal is to estimate the following equation for eligible children only:

$$\mathrm{HS}_{ics} = f(center_{cs},\ yrsmig_{ics},\ trnsprt_{cs},\ X_{ics},\ services_{cs},\ \mathrm{HS}_{-ics},\ X_{-ics},\ states) + \alpha_{cs} + \varepsilon_{ics} \quad (1)$$

where i is the individual, c is the census tract of residence, and s is the state of residence. *center* is our measure of local availability, and equals 1 if a HS center is in the census tract and 0 otherwise. *yrsmig* includes two dummy variables for how long ago the family migrated: 0–5 years ago (the child directly migrated) and 5–10 years ago, with greater than 10 years the omitted category. *trnsprt* includes census tract level measures of car ownership and public transit use (no individual level measures are available in the ECLS-K). X are individual level covariates that affect participation in HS, *services* are a set of dummy variables to reflect whether a particular type of non-profit service or church exists in the census tract, and HS_{-ic} and X_{-ic} are corresponding peer measures. $State_s$ are state dummy variable that capture other public child care services at the state level. α_c is a census tract level term to account for dependence of error terms within a census tract and ε_{ic} is an i.i.d. error term. Our main testable hypothesis is that the demand for HS increases with proximity to HS ($\delta\mathrm{HS}/\delta proximity > 0$). Two additional hypotheses are that demand for HS increases with proximity more for those who typically use public transit ($\delta^2\mathrm{HS}/\delta proximity\ \delta trnsprt > 0$) or who have migrated most recently ($\delta^2\mathrm{HS}/\delta proximity\ \delta yrsmig > 0$).

We begin by estimating the following linear model by ordinary least squares for children potentially eligible for Head Start:

$$\mathrm{HS}_{ic} = \beta_1 center_c + \beta_2 yrsmig_{ic} + \beta_3 trnsprt_c + \beta_4 X_{ic} + \beta_5 services_c + \beta_6 \mathrm{HS}_{-ic} + \beta_7 X_{-ic} + state_s + \alpha_c + \varepsilon_{ic}. \quad (2)$$

To obtain unbiased estimates of local availability of HS, having a center in the census tract must be uncorrelated with both the group and individual error terms. A correlation between the individual error term and HS would suggest sorting—families endogenously locating in areas because of the availability of Head Start. Although there are several arguments why we may not expect sorting based on HS *per se*,[20] we cannot rule this out as a possibility. Furthermore, even if individuals do not sort with respect to HS *per se*, HS centers may locate selectively or other services aimed at poor children may locate selectively in the same areas as Head Start centers. If this is the case, then the characteristics of the area with HS centers would differ from areas without HS centers. And if peers and services affect participation in HS, then proximity to a Head Start center will be correlated with the group error term.

Our main approach for minimizing these possible correlations is to flexibly control for numerous individual and neighborhood characteristics and availability of other services by using propensity score methods. Although we can control for these covariates linearly in Eq. (2), this may mask more subtle relationships between the covariates and HS participation. For example, it may be the case that having many low-income neighbors does not matter for HS participation on average, but only matters if these low-income

[16] See e.g. Moffitt (1983), Daponte et al. (1999), see also review in Remler and Glied (2003).

[17] We do not explicitly focus on stigma since it is largely unobservable and difficult to separate from transaction costs and information (Moffitt, 1983). We also admittedly ignore the endogeneity of eligibility, but since enrollment in HS is not guaranteed, it would be a risky strategy for a family to lose income to become eligible for HS.

[18] A potential concern with using car ownership is it may reflect wealth. While we do not have any direct measures of wealth in our data, we have included several income variables and included housing prices to proxy for wealth.

[19] We also recognize that such a pattern could be consistent with more recent immigrants having different preferences regarding enrollment in HS, but we lack data to separate out these hypotheses.

[20] One, because of the excess demand for Head Start, admittance is not guaranteed, so specifically moving to an area with a center is a risky strategy. Two, as previously mentioned, many families are unaware of Head Start as an option for their child, so it is unlikely they sort on something they do not know about. Three, families do not need to locate in the specific census tract with a center, only in the catchment area, and we use the presence of a center in the census tract as the main variable of interest. Therefore, in the event that families do sort they can locate in any census tract within a catchment area.

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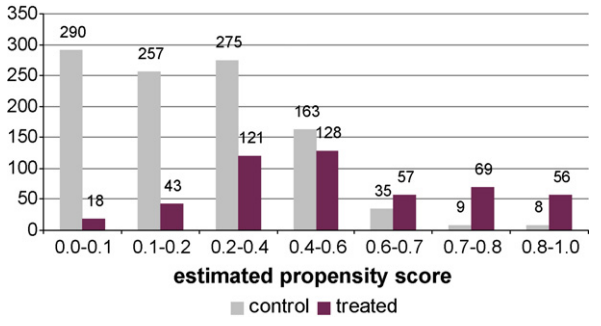

Fig. 1. Histogram of treated and controls within blocks.

neighbors are of the same race, as in the contact availability measures developed by Bertrand et al. (2000). Absent explicit controls for these potential interactions, linear regression adjustment may yield biased estimates. Propensity score methods, when successfully applied, allow for this interaction as well as other interactions and higher order moments of all included independent variables.

There are several techniques available for implementing the propensity score (see Imbens, 2004, for an overview), and we primarily use the stratification (or blocking) method (Dehejia & Wahba, 1999; Rosenbaum & Rubin, 1983). The first step involves estimating the probability of having a center in the tract on the other covariates in equation (1). Based on these estimates, we then predict the probability of having a center in tract (the propensity score), and create several bins (or blocks) so that the propensity score is not statistically significantly different across the treatment and controls within each bin, where treatment = 1 if a center is in the tract and control = 1 if a center is not in the tract.[21] Fig. 1 shows the number of treated and controls in each of the seven created bins.[22] Since there are few comparison units available to match to the treated units in the highest bins, results may be sensitive to the exact propensity score method chosen. Therefore, in addition to blocking we also use nearest neighbor matching (with replacement) and radius matching, which may alleviate this concern by better comparing treated units to more appropriate comparison units (Dehejia & Wahba, 2002). After creating the bins, we compute the difference in HS participation by treatment status within each bin (not adjusting for the covariates), and then combine these estimates (using the number of treated in each bin as weights) to compute the overall average treatment effect on the treated.

An essential step in applying the propensity score method is to assess whether the covariates balance across treatment status. Using a logit specification of the propensity score with the covariates entering linearly,[23] we reject a total of only 3 out of 413 tests of the null hypothesis of no mean difference across treatment status within each bin.[24] Table 1 further demonstrates the success of this method in balancing the covariates by displaying the difference in the means of the covariates across treatment status along with *t*-statistics to assess where the differences are different from zero. We show both the unadjusted differences and *t*-statistics in columns 2 and 3 and adjusted differences (by estimating the treatment effect for each covariate) and *t*-statistics in columns 4 and 5. For ease of exposition, we only show variables where there is a statistically significant unadjusted difference (except we show all transportation and years since migration variables).[25] In terms of the individual level covariates, the unadjusted covariates balance fairly well, but some significant differences emerge, such as number of siblings, race, and use of other services. In terms of neighborhood characteristics, centers typically locate in poorer, less educated areas with more minorities, lower employment rates, and higher use of public assistance. In terms of services, centers appear somewhat randomly assigned, with only Presbyterian and Methodist churches correlated with HS centers. All of these differences, however, are eliminated when using the propensity score to adjust the difference in means, suggesting this technique has achieved its goal of balancing the covariates. These results suggest that our implementation of the propensity score will adequately control for the functional form of our covariates.

A standard limitation of this method is it assumes unconfoundedness—we must observe all variables that affect participation and are partially correlated with local availability of HS. This is not a trivial assumption, as we can never be certain that we have observed all confounding variables. To partially address this concern, we demonstrate that our propensity score estimates are largely insensitive to the exclusion of numerous covariates particularly likely to confound estimates, which lends support to the unconfounding assumption.

5. Results

5.1. Impact of Head Start center in census tract on participation of immigrants

Table 2 presents estimates of the impact of having a Head Start center in the census tract on Head Start participation for immigrant children using a linear probability model (OLS) and stratification based on the propensity score (PSC). The OLS results with basic controls (column 1) for individual level covariates indicate having a center in the tract increases enrollment by 9 percentage points. As we

[21] We begin with five evenly spaced bins. If the propensity score is not balanced within each bin, we divide it in half and continue the process until balance is achieved. This procedure yielded seven bins: 0–0.1, 0.1–0.2, 0.2–0.4, 0.4–0.6, 0.6–0.7, 0.7–0.8, and 0.8–1.0.

[22] We choose a common support by omitting observations from the control group where the propensity score is lower than the minimum propensity score of the treated, which resulted in discarding 50 controls. Our results are generally insensitive to this restriction.

[23] We also present estimates using a probit specification, and this makes little difference.

[24] This does not include testing the state fixed effects, which are primarily included as nuisance parameters. As we show below, propensity score estimates are insensitive to the exclusion of state fixed effects.

[25] Although common practice is to report normalized differences rather than *t*-statistics, which are influenced by sample size, this does not influence the main implications from the table. Nonetheless, the normalized unadjusted differences (not shown) also reveal lack of covariate balance.

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Table 1
Difference in means by treatment status.

	1 Mean	2 Unadjusted difference	3 *t*-Statistic	4 Adjusted difference	5 *t*-Statistic
Individual level covariates					
Head Start enrollment	0.238	0.105	3.89	0.091	2.27
# grandparents close	1.438	−0.124	−2.14	0.040	0.47
Migrate <5 years	0.084	0.04	1.91	−0.013	−0.34
Migrate 5–10 years	0.196	−0.002	−0.09	−0.010	−0.30
Other language at home	0.851	0.06	3.00	0.010	0.36
AFDC	0.327	0.073	2.28	−0.039	−0.87
WIC	0.842	0.046	2.30	0.012	0.42
Ever in poverty	0.658	0.077	2.66	0.020	0.53
White	0.082	−0.039	−2.60	0.000	−0.01
Hispanic	0.641	0.095	2.44	−0.001	−0.01
# siblings	1.749	0.314	3.02	0.127	0.93
Neighborhood characteristics					
% poverty	0.202	.047	4.04	−0.012	−1.04
% public assistance	0.075	.023	3.94	−0.007	−1.26
% own home	0.514	−.062	−2.98	0.013	0.54
Median rent ($1k)	0.634	−0.066	−3.88	0.006	0.45
Median HH income ($1k)	36.862	−5.815	−5.21	0.980	1.04
Pop. density	11,865.2	−2999.8	−1.98	−774.4	−0.66
% White	0.526	−.071	−3.47	0.012	0.62
% Hispanic	0.424	.076	2.38	0.006	0.19
% linguistic isolated	0.157	.035	2.76	−0.006	−0.40
% age 0–17	0.297	.027	4.52	0.004	0.74
% age 65+	0.100	−.011	−2.38	−0.003	−0.78
% in labor force	0.591	−.028	−3.55	−0.002	−0.27
% HS dropout	0.363	.079	3.87	−0.002	−0.13
% no cars	0.169	0.015	1.07	−0.019	−1.07
% 1 car	0.362	0.003	0.38	−0.011	−1.46
% public transit	0.827	0.01	0.67	0.014	0.73
Service availability					
% Presbyterian Church	0.091	0.073	2.09	0.008	0.18
% Methodist Church	0.099	0.114	3.08	0.013	0.30

Note: 'Unadjusted difference' is treated minus controls. 'Adjusted difference' adjusts for the propensity score. Only variables where the unadjusted difference is statistically significant (all adjusted differences are not statistically significant), except for transit variables and years since migration, are shown. Other variables include the following *individual level covariates*: birth weight, race, early maternal employment, current employment status, presence of father in household, type of residence, gender, food stamp participation, family income, maternal education, and maternal age; *neighborhood characteristics*: median house price, % Black, % enrolled HS, % foreign born, % HS graduate, % no cars, % public transit, and % single; *service availability*: abuse clinic, boys and girls club, Catholic Church, church of god, community center, health clinic, mental health clinic, recreation facilities, and services for poor.

add more covariates to the model, the estimate generally decreases monotonically, ending up with a 6 percentage point estimate with all covariates included. Although this 50% drop in estimates is not statistically significant, the consistent downward pattern gives pause to whether these estimates are unbiased. One could reasonably conclude that OLS estimates are upward biased and further controls could render this estimate insignificant.

Table 2
Estimates of impact of Head Start center in census tract on Head Start participation for immigrants.

	1	2	3	4	5
A. OLS					
Center in tract ($N = 1619$)	0.089 [0.027]**	0.081 [0.027]**	0.086 [0.025]**	0.072 [0.026]**	0.06 [0.027]*
B. Propensity score estimates					
Center in tract	0.091 [0.028]**	0.083 [0.027]**	0.095 [0.027]**	0.084 [0.031]**	0.104 [0.033]**
# treated	492	487	492	492	492
# controls	1127	1119	1079	1082	1040
Covariates included					
Basic individual variables	Y	Y	Y	Y	Y
Additional individual variables	N	Y	Y	Y	Y
State fixed effects	N	N	Y	Y	Y
Service availability variables	N	N	N	Y	Y
Neighborhood characteristics	N	N	N	N	Y

Notes: Standard errors that cluster on census tract in brackets, where # of clusters = 855. See Table 1 for list of covariates within each category.
* Significant at 5%.
** Significant at 1%.

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In the second panel, our PSC estimate with limited controls (column 1) also reflects a 9 percentage point effect on enrollment from having a center in the tract, like OLS estimates. This estimate, however, varies much less than OLS estimates as we add more covariates and any variation appears unsystematic. In the full model with all individual covariates, census tract level demographics, service availability, and state fixed effects our estimate increases slightly to 10 percentage points—so the downward trend in the OLS estimates is not present in the propensity score estimates. This implies that, despite the extensive set of controls in the OLS model, the sensitivity of the OLS estimates is due to interactions between the covariates or higher order moments or both. We also note that although OLS estimates are more sensitive to controls, our OLS estimates fall within the confidence intervals of the PSC estimates. Further, because the PSC estimates are insensitive to adding more controls, this provides more confidence in the unconfoundedness assumption. These results imply that having a Head Start center in the tract raises Head Start participation among immigrant children by roughly 10 percentage points.

We also explore the heterogeneity of impacts by estimating the treatment effects separately for each bin shown in Fig. 1. These results (not shown), suggest the treatment effect is generally larger in the higher propensity score bins and smaller in the lower bins. Although estimates for each bin are generally imprecise, they suggest children are more likely to respond to local availability of HS if they are more likely to live in an area that has a HS center in their tract. This would suggest that a policy effort to increase enrollment by opening more centers would be more effective if it targeted areas that are more comparable to areas that currently have HS centers, rather than randomly assigning them to areas without centers.

In Table 3, we further assess the robustness of our results to alternative propensity score methods. First, in addition to using all covariates when estimating the propensity score, we also include them in the second stage when we compute the treatment effects within each block, a "doubly robust" method (Imbens, 2004). Estimates fall slightly to 7 percentage points, but well within the confidence interval of our main estimate from Table 2. Second, instead of stratifying based on the propensity score, we perform nearest neighbor matching (with replacement) and radius matching (with varying radii) based on the propensity score, which may decrease bias by improving the quality of the match (Dehejia & Wahba, 1999, 2002; Imbens, 2004). Shown in columns 2–5, our estimates are nearly identical to the preferred estimate in Table 2. Third, instead of using a logit model in estimating the propensity score, we estimate a probit model, and results are also nearly identical to before. We also estimate our model using verified HS participation as the dependent variable rather than parent self-reports (column 5), and find this makes little difference in the point estimates, though the standard error decreases slightly.

Since we find evidence that local availability affects take-up of HS, we assess the type of care children substitute away from. Using three alternative choices (parental care, informal care, other center-based care), we estimate a

Table 3
Specification checks.

	Regression adjustment	Nearest neighbor	Radius matching ($D = 0.05$)	Radius matching ($D = 0.02$)	Radius matching ($D = 0.01$)	Probit	HS verified	MNL
	1	2	3	4	5	6	7	8
Center in tract	0.102 [0.032]**	0.094 [0.044]**	0.084 [0.034]**	0.097 [0.036]**	0.091 [0.034]**	0.094 [0.033]**	0.092 [0.027]**	
Parental care								−0.248 [0.188]
Relative/non-relative care								−0.352 [0.243]
Other center-based care								−0.396 [0.204]*
Observations								1607
# treated	492	521	491	491	465	492	497	
# controls	1040	252	1040	1040	1040	1007	1059	

Note: Standard errors that cluster on census tract in brackets. All estimates include full set of controls from column 5 of Table 2. 'Regression adjustment' is propensity score estimates that adjusts for all covariates excluding state fixed effects in the second stage. 'Nearest neighbor' uses nearest neighbor matching with replacement based on propensity score estimates. 'Radius matching' uses comparison units within D units of the estimated propensity score. 'Probit' uses probit model (instead of logit) to estimate the propensity score. 'HS verified' uses a verified measure of enrollment in HS as the dependent variable. 'MNL' is multinomial logit estimates, where HS is the base outcome.

* Significant at 5%.

** Significant at 1%.

Table 4
Exploring factors that moderate participation in Head Start.

	1 Low car ownership	2 High car ownership	3 High public transit	4 Low public transit
A. Transportation costs				
Center in tract	0.137 [0.040]**	0.002 [0.055]	0.115 [0.033]**	0.061 [0.081]
# treated	361	126	348	144
# controls	629	416	669	371
	Migrate <5 years	Migrate 5–10 years		Migrate >10 years
B. Information				
Center in tract	0.171 [0.092]*	0.138 [0.091]		0.078 [0.036]**
# treated	42	91		341
# controls	90	211		757

Note: Standard errors that cluster on census tract in brackets. All estimates are based on propensity score method that include full set of controls from column 5 of Table 2. 'Low car ownership' is lives in census tract with % of HHs with 0 cars >median (transportation costs high). 'High car ownership' is lives in census tract with % of HHs with 0 cars <median (transportation costs low). 'High public transit' is lives in census tract with % of workers who drive to work <median (transportation costs high). 'Low public transit' is lives in census tract with % of workers who drive to work >median (transportation costs low).

* Significant at 5%.

** Significant at 1%.

multinomial logit model. Shown in column 5 of Table 3, we find that local availability has comparable negative impacts across all types of alternative care, though only the estimate for other center-based care is statistically significant. This suggests that children's access to HS draws children away from all types of care and not just parental care.

5.2. Exploring transportation and information costs

We motivated our analysis of Head Start location by saying it should affect participation by reducing transportation costs or increasing information about the program, and we explore these channels in Table 4. To explore the role of transportation costs, we split our sample into census tracts with "low" and "high" transportation costs (based on the census tract median value) and assess the impact of having a center in tract for each. If local availability affects HS participation by reducing transportation costs, then the impact from having in a center in a tract should be larger for those with higher transportation costs. Consistent with this, we find that having a Head Start center in the tract has a larger impact on participation among those facing high transportation costs than among those facing lower costs. Having a center in the tract increases enrollment by 14 percentage points in areas with car ownership below the census tract median (indicating high transportation costs), but has no statistically significant impact in areas with car ownership above the census tract median. The impact from having a center in tract is also larger in areas with use of public transit above the census tract median (indicating high transportation costs), with an estimated impact of 12 percentage points versus 6 percentage points in low public transit use areas. These findings suggest that those facing higher transportation costs are more sensitive to having a Head Start center in their tract.

Table 4 also presents evidence on the potential role of information in affecting HS participation. If local availability affects HS participation by increasing information and recent immigrants have less information about HS availability, then the impact from having a center in a tract should be larger for those who migrated more recently.[26] We explore this by estimating the impact of having a Head Start center in the tract on Head Start enrollment among immigrants who migrated within the past 5 years, 5–10 years previously, or more than 10 years ago. The results (panel B) indicate the largest impact of Head Start availability for the most recent migrants (17 percentage points), followed by those who migrated 5–10 years previously (14 percentage points), and then by those who migrated more than 10 years ago (8 percentage points). This pattern suggests that having a center nearby has a greater affect on participation for newer migrants, consistent with the hypothesis that information affects program participation.[27]

5.3. Impact of Head Start center in census tract on participation of other groups

We also explore the impact of local availability of HS on participation for non-immigrants, both for all and separately race and ethnicity, shown in Table 5. To the extent that local availability increases participation by providing information to groups less familiar with HS, we would not expect to find strong impacts of availability for non-immigrant groups who presumably would be more familiar with HS and other social programs. Our OLS and PSC estimates provide similar interpretations, so we focus our discussion only on OLS estimates. Focusing on all non-immigrants, we find the impact from having a center in the tract is highly sensitive to the inclusion of controls, ranging from a statistically significant estimate of 6.4 percentage points with limited controls to a statistically insignificant

[26] We recognize that newer immigrants may differ from older immigrants in other ways that affect their participation decisions, such as preferences for using center-based care, but we lack data to separate these hypotheses.

[27] Unfortunately we cannot distinguish whether these possible information affects are due to direct provision of information, social networks, or stigma.

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Table 5
Estimates of impact of Head Start center in census tract on Head Start participation for non-immigrants by race/ethnicity.

	1	2	3	4	5
A. OLS					
Center in tract—all (N = 4441)	0.064 [0.018]**	0.052 [0.018]**	0.034 [0.016]*	0.026 [0.017]	0.009 [0.017]
Center in tract—White (N = 2403)	0.029 [0.023]	0.01 [0.022]	0.006 [0.021]	0.004 [0.021]	−0.012 [0.022]
Center in tract—Black (N = 1429)	0.079 [0.035]*	0.073 [0.034]*	0.032 [0.031]	0.022 [0.033]	−0.009 [0.032]
Center in tract—Hispanic (N = 552)	0.087 [0.042]*	0.086 [0.042]*	0.07 [0.043]	0.062 [0.045]	0.041 [0.048]
B. Propensity score estimates					
Center in tract—all (# treated = 1320, # controls = 2992)	0.062 [0.018]**	0.054 [0.018]**	0.041 [0.020]*	0.027 [0.020]	0.032 [0.027]
Center in tract—White (# treated = 568, # controls = 1612)	0.032 [0.023]	0.014 [0.022]	0.019 [0.025]	0.023 [0.026]	0.001 [0.033]
Center in tract—Black (# treated = 481, # controls = 745)	0.078 [0.033]**	0.081 [0.033]**	0.016 [0.035]	0.019 [0.037]	−0.006 [0.049]
Center in tract—Hispanic (# treated = 190, # controls = 263)	0.101 [0.045]**	0.089 [0.047]*	0.091 [0.047]	0.076 [0.058]	0.053 [0.074]
Covariates included					
Basic individual variables	Y	Y	Y	Y	Y
Additional individual variables	N	Y	Y	Y	Y
State fixed effects	N	N	Y	Y	Y
Service availability variables	N	N	N	Y	Y
Neighborhood characteristics	N	N	N	N	Y

Note: Standard errors that cluster on census tract in brackets. # treated and # controls in Panel B are for estimates in column 5. See Table 1 for list of covariates within each category.

* Significant at 5%.

** Significant at 1%.

estimate of 0.9 percentage points with the full set of controls. The impacts by race and ethnicity shed more light on why the impacts decrease as we add more controls. For Whites, the impact is almost non-existent in all specifications. For Blacks, however, the impact with only individual level controls is comparable to the impact for immigrants, but it decreases substantially as we add more controls, with a −0.9 percentage point impact in the full model. For (non-immigrant) Hispanics, the impacts also diminish considerably as we add more controls, though the statistically insignificant estimate of 4.1 with the full set of controls is still sizeable. Most of the change in estimates comes from adding state fixed effects and neighborhood characteristics, suggesting state policies towards day care and peers play a prominent role in HS participation for Blacks and (non-immigrant) Hispanics. Importantly, these results suggest that although it seems obvious for a link between location and participation to exist, in fact the association between the two only exists for particular groups.

6. Conclusion

Many immigrant children face language barriers and lack familiarity with U.S. customs and norms, important skills for succeeding in school and beyond (Bleakley & Chin, 2004). Increasing immigrant children's enrollment in Head Start and other early childhood education programs has been identified as a key mechanism for improving their school readiness and later school achievement (Waldfogel & Lahaie, 2007). Despite this opportunity, low participation rates in these programs slow such potential progress, so understanding the factors affecting take-up may shed light on how to increase enrollment.

In this paper, we provide evidence on the impacts of Head Start location on enrollment for immigrant children using data from the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K). We find that having a center in the census tract increases enrollment by roughly 10 percentage points, which is a 50% increase. While this is a large effect, it is comparable to what other studies have found. For example, Aizer (2007) found that bilingual advertising increased Medicaid take-up from 16% to 46% for Hispanics and 26% to 45% for Asians. Although local availability of Head Start may be endogenous, our estimates are generally insensitive to flexibly controlling for numerous neighborhood factors via propensity score methods, suggesting we are observing the relevant forms of endogeneity. The impacts of local availability are larger for those with limited access to personal transportation and limited time in the country, consistent with both transportation costs and information as important factors affecting program participation for immigrant children.

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