Do child care subsidies influence single mothers' decision to invest in human capital?

Chris M. Herbst [a], Erdal Tekin [b],*

[a] School of Public Affairs, Arizona State University, Mail Code 3720, 411N. Central Ave., Ste. 450, Phoenix, AZ 85004-0687, United States
[b] Department of Economics, Andrew Young School of Policy Studies, Georgia State University, NBER, and IZA, P.O. Box 3992, Atlanta, GA 30302-3992, United States

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ABSTRACT

A child care subsidy is one of the most effective policy instruments to facilitate low-income individuals' transition from welfare to work. Although previous studies consistently find that subsidy receipt is associated with increased employment among single mothers, there is currently no evidence on the influence of these benefits on the decision to invest in human capital. Using data from the Kindergarten cohort of the Early Childhood Longitudinal Study, this paper examines the impact of child care subsidy receipt on the likelihood of engaging in education and job training activities. We identify the impact of subsidy receipt by exploiting plausibly exogenous geographic variation in the distance that parents must travel from home in order to reach the nearest social service agency that administers the subsidy application process. Results suggest that child care subsidies encourage single mothers to engage in human capital investment. In particular, our instrumental variables estimates imply that subsidy receipt increases the likelihood that a single mother enrolls in courses at a school or university by 13 percentage points and participates in a job training program by 8 percentage points.

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1. Introduction

Child care expenses constitute a significant item in the budget of low-income families. In 2009, the average cost of full-time center care for an infant ranged from approximately $4550 in Mississippi to more than $18,750 in Massachusetts, exceeding the average annual tuition for a four-year public college in 40 states (National Association for Child Care Resource & Referral Agencies [NACCRRA] (2010)).[1] National data indicate that child care costs comprise over one-quarter of poor families' income (Smith, 2000), greatly exceeding the federal recommendation that families spend no more than 10% of their income on child care (USDHHS, 2009). Data also show that these costs are on the rise. The cost of child care since 2000 has increased twice as fast as the median income of families with children. In fact, the average increase for a four-year-old child in center care exceeds the rate of inflation in all states (NACCRRA, 2010).

The high cost of child care poses a serious burden on the prospects for sustained employment and economic self-sufficiency particularly among low-income families. This burden became more severe with the passage of welfare reform in 1996, which shifted the focus of the social safety net from providing disadvantaged families with open-ended cash assistance to facilitating their transition from welfare to work. In order to expedite this transition, the new law consolidated the previously fragmented child care subsidy system into a single block grant, the Child Care and Development Fund (CCDF), and substantially increased

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funding for child care assistance.[2] Consistent with the explicit goal of welfare reform to increase employment and reduce welfare caseloads, CCDF funds are now targeted primarily at low-income families participating in a state-defined work activity.[3] Since most child care subsidy expenditures are made so that a parent may work, a child care subsidy increases the net return from employment by reducing this important work-related expense. Therefore, child care subsidies have long been recognized as an important policy tool to encourage employment among women with young children. Accordingly, researchers have dedicated substantial attention to the potential employment impact of these subsidies (e.g., Berger & Black, 1992; Blau & Hagy, 1998; Gelbach, 2002; Herbst, 2008; Tekin, 2005, 2007a, 2007b).[4] Findings from these studies consistently show that child care subsidies increase employment and reduce welfare use among low-skilled women with children.

Given the "work first" philosophy of welfare reform and the CCDF, the literature's focus on employment is not surprising. However, the law clearly allows parents to use child care subsidies while participating in a range of other work-related activities—including job training and education—as long as they meet the other eligibility criteria. Indeed, recent data show that a non-trivial fraction of subsidy-eligible parents engage in these activities. For example, using nationally representative data from the National Survey of America's Families (NSAF), Herbst (2008) finds that approximately 14% of eligible single mothers participate in job training programs and another 17% enroll in courses at the high school or college level. Schexnayder, Schroeder, Faliski, and McCoy (1999) provide direct evidence for Texas, finding that although most children receive subsidized care so that parents can work (62%), another 31% of children receive benefits to allow parents to attend job training or educational programs.

Despite the fact that child care subsidies are available to low-income parents engaged in job training and education, very little attention has been paid to studying these human capital outcomes. To our knowledge, the only available evidence comes from Blau and Tekin (2007), who examine the impact of child care subsidy receipt on employment, school attendance, unemployment, and welfare participation among single mothers using data from the 1999 NSAF. The authors find that subsidy receipt has no statistically significant effect on the decision to attend school. Currently, no evidence exists on the relationship between subsidy receipt and participation in job training.

In this paper, we attempt to fill this gap by analyzing the impact of child care subsidy receipt on single mothers' decision to participate in education and job training programs using data from the Kindergarten cohort of the Early Childhood Longitudinal Study (ECLS-K). Our investigation is motivated by several factors. First, as described above, there is almost no evidence on the role played by subsidy policy in encouraging parents to attend school and engage in job training activities. Second, we argue that encouraging parents to participate in activities like schooling and job training is critical to the success of welfare reform. Among the intended goals of welfare reform is to "end the dependence of needy parents on government benefits by promoting job preparation, work, and marriage."[5] Clearly, the desirable outcome from the government's perspective is to enable parents to earn enough to meet their basic needs without public assistance of any kind, and the law recognizes that this goal cannot be accomplished through employment alone. Improving skills by investing human capital through activities like education and job training may be necessary to help low-income parents access better jobs. Therefore, it is important to provide insights into whether child care subsidies encourage investments in school and job training activities among recipient parents.

2. Data

Our data are drawn from the Kindergarten Cohort of the Early Childhood Longitudinal Study (ECLS-K).[6] The ECLS-K is a nationally representative survey of approximately 21,000 children who entered kindergarten in the fall of 1998. Children in the sample are followed through the end of eighth grade, with parent and child interviews conducted in the fall and spring of kindergarten (1998 and 1999) and the spring of first (2000), third (2002), fifth (2004), and eighth (2007) grade. Over 20 children per school from over 1200 public and private schools are included in the sample.

In this study, we focus on the fall of kindergarten wave of data collection, in which parents were asked about contemporaneous education and job training activities as well as whether the focal children received subsidized care in the year before kindergarten entry. Our analysis sample retains children living with an unmarried biological mothers or female guardian (related or unrelated) at the start

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[2] See Herbst and Tekin (2010a, 2010b) for detailed descriptions of the CCDF.

[3] See SEC. 658P(3) of CCDF law at http://www.acf.hhs.gov/programs/ccb/law/ccdbgact/ccdbgact.pdf.

[4] Another source of evidence on the effect of child care subsidies comes from studies of the impact of the price of child care on maternal employment (e.g., Anderson & Levine, 2000; Blau & Hagy, 1998; Herbst, 2010; Kimmel, 1998; Tekin, 2007b). The consensus from these studies is that the price of child care has a negative impact on the employment of mothers.

[5] Personal Responsibility and Work Opportunity Reconciliation Act of 1996, Public Law 104-193, August 22, 1996.

[6] The ECLS-K is sponsored by the U.S. Department of Education. For more information, see the ECLS-K website at http://nces.ed.gov/ecls/kindergarten.asp. The ECLS-K used a multistage probability sample design to select the sample of children attending kindergarten in 1998. The primary sampling units (PSUs) were geographic areas consisting of counties or groups of counties. The second-stage consisted of public and private schools within sampled PSUs. The final stage units were students within schools. The school frame was freshened in the spring of 1998 to include newly opened schools that were not included in the original sample. Once the sample children were identified, parent contact information was obtained from the school, which was used to locate parents and seek consent for the child assessments and parent interviews. Completion rates (or response rates that are conditioned on earlier stages of data collection) for the fall of kindergarten interviews were high: 89.9% of child assessments were completed, 85.3% of parent interviews were completed, and over 90% of the teacher interviews were completed.

of kindergarten.[7] We focus on unmarried mothers because this group constitutes approximately two-thirds of eligible subsidy recipients (Herbst, 2008). Exclusions from the sample are made if the child is missing information on all outcome variables (1766) or the entire fall of kindergarten parent interview (740), the questions regarding child care subsidy receipt (35), and census tract identifiers (2256). We exclude an additional 12,607 children who do not meet our requirements for residence with an unmarried mother.[8] The resulting analysis sample includes 3848 children.

We exploit two survey questions regarding parental involvement in education and job training activities. First, parents were asked whether they are "currently attending or enrolled in any courses from a school, college, or university." Next, a question about current participation in a "job-training or on-the-job-training program" was posed.[9] We code these as separate binary indicators that equal unity if parents responded that they are currently participating in a given activity. We also create a combined variable that equals unity if parents are engaged in any of these activities.

The primary right-hand-side variable in this analysis is a measure of child care subsidy receipt, defined as a binary indicator that equals unity if a given child received subsidized, non-parental child care in the year prior to kindergarten. During the fall of kindergarten interview, parents were asked about the child care arrangements used throughout the previous year. For each arrangement, a set of follow-up questions were then directed at parents to ascertain whether any help was received in paying for child care expenses. Specifically, parents were asked the following: "Did any of the following people or organizations help to pay for this . . . provider to care for {CHILD} the year before {he/she} started kindergarten?" Four possible choices were then presented to parents, and we coded those answering "a social service agency or welfare office" as receiving a child care subsidy.[10] Thirteen percent of children in our sample are coded as receiving a child care subsidy. This figure is consistent with the U.S. Department of Health and Human Services' finding that 12–15% of eligible families received a CCDF subsidy during the same period (USDHHS, 1999).[11]

In addition to child care subsidy receipt, our models include a number of exogenous maternal and family characteristics that might be correlated with decisions regarding education and job training. In particular, we control for maternal age (years), race and ethnicity (three dummy variables), current educational attainment (three dummy variables), presence and number of children in the family (two dummy variables), household size, English as the primary home language, and urban residence. Since the ECLS-K will not enable us to construct a variable for non-wage income, we include a binary indicator for whether the mother or child ever received WIC benefits. Eligibility for WIC is based in part on familial economic resources, so this variable should be a reasonable proxy for sources of non-wage income. In robustness checks, we experiment with models that omit the WIC indicator and add (the log of) total family income. These changes do not alter the main results.

We further account for unobserved heterogeneity by including a large number of controls for the neighborhood (census tract) and school environments. For example, we add the (log of) median household income, the (log of) population density, percent non-Hispanic white, and the fraction of child ages 0–2 and 3–5 living in female-headed households. Our school controls include the percent of children eligible for free and reduced price lunches and a dummy variable indicating whether the school received Title I funding. These variables help to mitigate the concern that our instrumental variable, which is introduced in the next section, proxies for neighborhood and family characteristics that influence parental work activities. We also include state fixed effects to account for state-level policy, economic, and demographic unobservables that may influence preferences for education and job training.

Summary statistics for the work activity outcomes and demographic controls are presented in Table 1. Fully 17% of single mothers participate in education or job training. Enrollment in school is the predominant activity, with about 13% of mothers engaged in coursework at the high school or college level. Approximately 6% of mothers indicated that they participate in job training or on-the-job training programs. Subsidy recipients are significantly more likely to be engaged in any work-related activity than their non-recipient counterparts: 22% compared to 16%. Most of this difference is driven by the large participation disparity in school enrollment, in which 18% of subsidized single mothers are participating, compared to 13% among non-recipients. Turning to the demographic characteristics, subsidy recipients are younger, more likely to be black, and more likely to have received WIC. Although recipients are less likely to have a bachelor's degree, their high school drop-out rates are lower and they are more likely to have some college education. Therefore, it appears that subsidy recipients are not systematically less skilled than non-recipients.

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[7] In particular, children in our sample live with (1) a biological mother only, (2) a biological mother and a partner "father," (3) an unmarried adoptive mother who may or may not be living with a partner "father," and (4) or an unrelated, unmarried guardian who may or may not be living with a partner "father."

[8] Additional deletions are made because the mother reported a nonsensical age (6), or information from parent interview could not be merged with the geographic variables (2).

[9] Since the question includes the phrase "on-the-job training", it is likely that the training is offered through employers. However, the survey does not allow us to know whether it is publicly subsidized or not.

[10] Local social service agencies and welfare offices are typically the entities responsible for administering CCDF child care subsidies in the U.S. The Child and Dependent Care Credit is another employment-related benefit intended to defray families' child care expenses. However, this program is a federal tax credit and is not administered by local social service agencies.

[11] The subsidy question in the ECLS-K is similar to those in several other nationally representative surveys (e.g., National Survey of America's Families and the Survey of Income and Program Participation). The rates of child care subsidy receipt calculated by researchers using the NSAF match our

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ECLS-K estimate. For example, Tekin (2007b) calculates a participation rate of 11.6% for a sample of single mothers, and Herbst (2008) estimates a take-up rate of 13.9%, also from a sample of single mothers.

Table 1
Summary statistics.

Variable	(1) Full sample	(2) Subsidy recipient	(3) Non-recipient
Panel A: education and job training outcomes			
Any participation in education or job training	0.171(0.376)	0.222(0.416)	0.163[***](0.370)
Enrolled in courses at school or university	0.133(0.339)	0.178(0.383)	0.126[***](0.332)
Job training or on-the-job-training program	0.055(0.229)	0.072(0.259)	0.053[*](0.224)
Panel B: demographic characteristics			
Distance to social service agency (miles)	6.86(10.03)	6.11(10.61)	6.98[*](9.93)
Mother's age	30.45(6.41)	29.23(5.77)	30.63[***](6.48)
Mother is white	0.431(0.495)	0.420(0.494)	0.432(0.495)
Mother is black	0.340(0.474)	0.398(0.490)	0.332[***](0.471)
Mother is Hispanic	0.177(0.381)	0.146(0.353)	0.181(0.385)
Mother is other race/ethnicity	0.052(0.222)	0.036(0.186)	0.055[*](0.227)
Mother has less than high school	0.208(0.406)	0.161(0.368)	0.215[***](0.411)
Mother has high school/GED	0.374(0.484)	0.384(0.487)	0.372(0.483)
Mother has some college	0.326(0.469)	0.394(0.489)	0.316[***](0.465)
Mother has B.A.+	0.092(0.289)	0.060(0.237)	0.097[***](0.296)
Child is an only child	0.292(0.455)	0.235(0.424)	0.300[***](0.458)
Child has one sibling	0.357(0.479)	0.345(0.476)	0.359(0.480)
Child has two or more siblings	0.351(0.477)	0.420(0.494)	0.341[***](0.474)
Home language is English	0.899(0.301)	0.932(0.252)	0.894[***](0.308)
Household size	4.049(1.588)	4.066(1.560)	4.046(1.592)
Mother or child ever received WIC	0.741(0.438)	0.915(0.279)	0.715[***](0.452)
Urban residence	0.845(0.362)	0.815(0.389)	0.850[**](0.357)

Notes: Standard deviations are displayed in parentheses.

[***] The differences between subsidy recipients and non-recipients are statistically significance at 1% level.

[**] The differences between subsidy recipients and non-recipients are statistically significance at 5% level.

[*] The differences between subsidy recipients and non-recipients are statistically significance at 10% level.

3. Econometric framework

Conceptually, the relationship between child care subsidy receipt and mothers' human capital investment decisions can be summarized using a simple, single decision-maker framework. In this framework, a single mother maximizes the present value of her lifetime earnings net of human capital investment costs, where investment costs include both out-of-pocket costs and foregone earnings during the investment period. Mothers' time can be allocated to work, leisure, maternal child care, and investment in human capital. By reducing the cost of non-parental child care, a subsidy decreases time spent in maternal child care and increases time available for work and human capital investment. A mother can choose work, which would result in a short-run increase in earnings. Alternatively, she may choose to invest in human capital, which would raise her earnings capacity in the future without increasing her earnings during the investment period. The mother would choose contemporaneous investment over work if the present discounted value of her lifetime earnings when she invests in human capital exceeds the present discounted value of lifetime earnings when she works.

In this framework, a child care subsidy would have a non-negative effect on the education or job training decisions of the mother. Moreover, the mother's hourly wage, discount rate, and out-of-pocket costs of investing in human capital also play a role in her work and human capital investment decisions. For example, an increase in wages would raise the likelihood that a mother works and thus foregoes human capital investment. Furthermore, a rise in the discount rate would also reduce the likelihood that the mother invests in human capital and increases the likelihood that she works. Finally, increased out-of-pocket costs of human capital investment would further lower the likelihood that the mother participates in education and job training activities. In these cases, she would allocate the additional time made available by a child care subsidy to increased participation in the paid labor force. Therefore, the magnitude of the subsidy impact depends on the discount rate, the amount of foregone earnings, and the direct costs of human capital investment.

Empirically, the relationship between child care subsidy receipt and human capital investment decisions can be examined using the following reduced form model:

$$HC_i = \alpha_0 + \alpha_1 s_i + \mathbf{X}_i \alpha_2 + \mathbf{N}_i \alpha_3 + \nu_s + \varepsilon_i, \tag{1}$$

where HC_i is a binary indicator for the observed education or job training participation decision of the ith single mother. The s_i is a binary indicator of child care subsidy receipt. The vector $\mathbf{X}$ includes the observed determinants of mothers' human capital investment decisions. These variables may also proxy for mothers' discount rate and foregone earnings potential. There may also be local- and state-level policy, economic, and demographic factors that are associated with preferences for schooling and training, the cost of these activities, and differences in discount rates, all of which are captured by the vector of observable neighborhood characteristics, $\mathbf{N}$, and state fixed effects, ν_s. Note that mothers' hourly wage rate also belongs in Eq. (1). Rather than explicitly controlling for the wage rate, we adopt a quasi-reduced form approach and substitute a number of exogenous determinants of this variable. We do so first because hourly wages are clearly endogenous to human capital investment decisions, and second because the ECLS-K does not provide sufficient information to allow us to construct such a measure.

Estimation of Eq. (1) with the ordinary least squares (OLS) is complicated by the potential endogeneity of subsidy receipt (Blau & Tekin, 2007; Herbst & Tekin, 2010b). Subsidy receipt is likely endogenous because recipients are not a random sample of all eligible mothers. In other words, we are concerned about the presence of unmeasured attributes associated with the decision to seek and accept a child care subsidy that also partially determine decisions related to human capital investment. For example, a mother who is highly motivated to achieve economic self-sufficiency may also be more motivated to seek a child care subsidy, thereby generating a positive correlation between the error term, ε_i, and subsidy receipt. Alternatively, the least-skilled mothers may be singled out for child care assistance by local subsidy administrators, imparting a negative correlation between the error term and subsidy receipt. It may also be true that caseworkers give priority to the most highly skilled mothers, thereby generating the greatest "return on investment" and allowing states to meet work participation targets set by the federal government.

Another concern with estimating (1) using OLS is the possibility of classical measurement error in subsidy receipt. There are numerous sources of potential measurement error, ranging from the inability of parents to recall whether and when child care assistance was received to confusion over the source of child care funding (e.g., child care tax credits, Head Start, CCDF). In such cases, the estimated effect of child care subsidy receipt would be biased downward. It is also important to note that our measure of subsidy receipt refers to the year prior to children's entry into kindergarten, while the human capital outcomes refer to participation in the fall of kindergarten. Therefore, we are not able to examine the contemporaneous relationship between subsidy receipt and maternal decision-making. However, this is not a serious limitation for our purposes: although some mothers may make immediate use of their subsidy for human capital investment, others may experience short delays in between the time the subsidy is authorized and when the education and job training programs actually commence. In addition, using a lagged measure of subsidy receipt mitigates the potential simultaneity between subsidy receipt and human capital investments. We rely on an instrumental variables approach to address the endogeneity and measurement error of subsidy receipt. To produce consistent estimates of the impact of subsidy receipt using instrumental variables, we need at least one variable that is correlated with subsidy utilization but uncorrelated with maternal human capital decisions except through its relationship with subsidy receipt. Our proposed instrument is based on the *distance* that families must travel from home in order to reach the nearest social service agency that administers the subsidy application process. The plausibility of this instrument rests in part on the assumption that families living in an area with an agency nearby face lower costs of obtaining a subsidy. It is therefore hypothesized that an inverse relationship exists between the likelihood of subsidy utilization and the distance between home and the closest social service agency. Furthermore, it is plausible that mothers' travel distance to an agency influences maternal human capital decisions only indirectly through its impact on subsidy utilization and should not directly influence these decisions.

To implement this strategy, we began by creating a database containing the precise location (building number, street name, city, state, and zip code) of virtually every social service agency in the U.S.[12] In doing so, we were careful to ensure that a given agency is involved in eligibility and benefit determination for CCDF child care subsidies. Our database contains location information on over 3600 social service agencies.[13] The next step in the process involved geocoding the location of administrative offices by assigning a latitude and longitude coordinate to each. In the final step, we calculated the Euclidean (or as-the-crow-flies) distance (in miles) between the location of social service agencies and the centroid (or geographic center) of the census tract in which ECLS-K families reside. We generate the distance measure based on families' census tract because residential addresses are not available in the ECLS-K. Furthermore, given that states' child care subsidy programs are administered primarily at the county-level, the distance measure is based on the nearest social service agency in the county of residence.

As Herbst and Tekin (2010a, 2010b) discuss in detail, there are several reasons why one would expect a strong relationship to emerge for the distance between home and the nearest social service agency. First, it has been shown that low-income families already face significant work- and child care-related costs due to the limitations of public transportation systems and low car ownership rates (Allard, 2009; Berube & Raphael, 2005; Ong, 2002). Edin and Lein (1997) document that single mothers' commute time to work is about 10 h per week on average, with another study finding that mothers' daily trip from home to the child care provider adds 28% more time to the total commute (Michelson, 1985). It is therefore not surprising that low-income working mothers stress the importance of locating child care services close to home or work (Henly & Lyons, 2000).[14]

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[12] See Appendix A in Herbst and Tekin (2010b) for a detailed discussion of how the social service agency database was complied and how the distance instrument was constructed.

[13] Most states administer child care subsidies at the county-level, with one agency located in each county. However, in many urban counties and cities, there are multiple agencies in a county. On the other hand, there are a small number of rural counties without a social service agency. Thus, clients living in these counties must travel to adjacent counties to apply for child care assistance. We attempt to account for these complications in constructing our database. Specifically, social service agencies located in multiple-agency-jurisdictions are each treated as separate entries. Agencies that serve families from multiple counties are repeated in the database—with each entry denoting the relevant county served by the office—and we continue to match families to the nearest agency. Approximately one-third of single mothers in our sample have access to two or more social service agencies in their county of residence. In those cases, our measure is defined such that the minimum distance is assigned to a given single mother.

[14] Another study finds that nearly 70% of low-income parents rate "conveniently located services" as very important to their child care decisions, compared to 50% among high-income parents (U.S Department of Education, 1995).

Table 2
Distance to social service agencies and the take-up of child care subsidies.

Outcome	(1)	(2)	(3)	(4)
Panel A: linear specification				
ln(distance to social service agencies)	-0.016^{**}(0.008)	-0.015^{*}(0.009)	-0.020^{**}(0.009)	-0.017^{**}(0.008)
Panel B: non-linear specification				
Distance to social service agencies	-0.005^{***}(0.002)	-0.005^{***}(0.002)	-0.006^{***}(0.002)	-0.005^{***}(0.002)
(Distance to social services agencies)^2	0.008^{***}(0.002)	0.008^{***}(0.002)	0.009^{***}(0.002)	0.009^{***}(0.002)
(Distance to social services agencies)^3	-0.003^{***}(0.0005)	-0.002^{***}(0.0006)	-0.003^{***}(0.0006)	-0.003^{***}(0.0006)
Mean distance to social service agencies	6.87 miles	6.87 miles	6.87 miles	6.87 miles
Subsidy participation rate	0.130	0.130	0.130	0.130
Family controls		X	X	X
Neighborhood controls			X	X
Geographic controls				X
Number of observations	3848	3848	3848	3848

Notes: All models are estimated using OLS. Standard errors (in parentheses) are adjusted for county-level clustering. The family controls include all variables listed in Table 1 (except for the indicator of urban residence). The neighborhood controls (measured at the census tract-level) include the log of median household income, percent non-Hispanic white, percent foreign born, and a dummy variable for urban residence. The geographic controls include nine dummy variables for Census region.

*** A given coefficient is statistically significance at 1% level.
** A given coefficient is statistically significance at 5% level.
* A given coefficient is statistically significance at 10% level.

In addition, the travel distance to a social service agency can influence subsidy utilization during multiple stages of a mother's interaction with the subsidy system (Herbst & Tekin, 2010a, 2010b). In particular, most parents are required to make one or multiple personal visits to an agency to undergo the initial in-take and eligibility screening. Making these visits can be particularly challenging for low-income parents, who tend to have less access to automobile transportation and are more likely to experience frequent job turnover, seasonal or irregular work hours, and highly volatile earnings (Holzer & Martinson, 2006; Layzer & Burstein, 2007; Ong, 2002; Waller, 2005). Finally, policies regarding eligibility recertification may require parents to make multiple trips to the local social service agency. In particular, the time-limited nature of child care subsidies—usually lasting three to 12 months—implies that parents need to restart the eligibility process every few months or risk benefit termination. For these conceptual reasons, it is assumed that parents residing near an agency face lower costs of obtaining a subsidy, which implies an inverse relationship between the travel distance and child care subsidy utilization. This proposition finds empirical support in our data, as shown in Table 2, which presents results of OLS regressions of the binary indicator of subsidy receipt on single mothers' travel distance, controlling for a rich set of child, family, neighborhood characteristics. The top panel presents coefficients using the natural logarithm of the distance to the nearest social service agency. We also present in the bottom panel results from specifications that allow for a non-linear relationship by incorporating quadratic and cubic terms in distance. Column (1) includes only the distance measure, while column (2) controls for family characteristics. Columns (3) and (4) add neighborhood characteristics at the census tract-level and geographic factors to indicate urban/rural residence and census regions, respectively. As seen in the top panel, families travel distance has a negative and statistically significant effect on the propensity to receive child care assistance. The coefficient on the distance measure in column (4) indicates that a 1% increase in the mileage to the nearest social service agency is associated with a 2 percentage point decrease in the likelihood of receiving a subsidy. Results in the bottom panel show that the relationship between distance and subsidy receipt is non-linear.

As explained in Herbst and Tekin (2010a), it is reasonable to assume that the monetary and psychic costs associated with a given travel distance is expected to vary according to where a family resides. For example, there is substantial geographic variation in the availability of local roads and highways, the amount of traffic congestion associated with these roads, and the accessibility of substitute forms of public transportation. Such differences across geographic regions suggest that it may not be appropriate to express the relationship between travel distance and subsidy receipt as being identical for mothers across all jurisdictions. To investigate this issue, we produce county- and state-specific correlations between the distance measure and subsidy receipt. As expected, both sets of correlations are negative on average, but the amount of variation is substantially greater among counties, as evidenced by a comparison of the standard deviations: 0.305 for the county-specific correlations and 0.172 for the state-specific correlations. Additional evidence of between-county variation in the distance–subsidy relationship is provided by comparing correlations across urban and rural counties. Not surprisingly, the average correlation in rural counties is nearly three times larger than that in urban counties, but the spread of correlations around the mean is also greater (SD rural: 0.397 versus SD urban: 0.277). Our identification strategy therefore exploits this county-level variation in travel distance by interacting the distance measure with mothers' county-of-residence indicators. With a *p*-value less than 0.001, the set of distance–county interactions is highly statistically significant in the first-stage equation.[15] In order for the dis-

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[15] The first-stage F-statistic on the excluded instruments is 121.36. It is important to note that we experiment with models that replace the state fixed effects with county fixed effects, while maintaining the county-by-

tance measure to serve as an identifying instrument, it has to be validly excluded from Eq. (1). One concern regarding the validity of families' travel distance is that low-income parents may choose to live near local service agencies. In addition, these agencies might locate in low-income neighborhoods in order to be close to potential clients. If the location decisions of parents and agencies are not orthogonal to parental characteristics and preferences that are also correlated with their human capital investment decisions, the coefficient on subsidy receipt will be biased. However, as discussed in Herbst and Tekin (2010a) endogenous location choices find little empirical support in the literature. On an intuitive level, these endogenous decisions are more plausible for entitlement programs than child care subsidies, which serve only a small percentage of eligible families and are heavily rationed by local administrators (Herbst, 2008).

Nevertheless, we include in the model a rich set of family, neighborhood, and school characteristics to account for endogenous location choices. Furthermore, we conduct a robustness check that utilizes an ECLS-K item inquiring about whether a given family chose its current home location based on the attributes of local schools. Controlling for this variable does not substantially change our main results. Finally, we estimate the models separately on those mothers who chose the current home location based on school attributes and those who did not. Again, our results are robust to this exercise.

It is also possible that mothers facing shorter distances to an agency do so in part because they live in high-population-density (urban) and low-income neighborhoods. Conversely, those with longer distances may reside in largely rural and racially homogenous areas. To the extent that the neighborhood environment is associated with opportunities to invest in human capital, the travel distance may be systematically related to these outcomes. If these environmental factors are not properly accounted for in Eq. (1), the distance measure would not constitute a valid instrument.

In Herbst and Tekin (2010a, 2010b), we examine the distribution of child and maternal characteristics across the quartiles of the travel distance. A simple comparison indicates that mothers living near social service agencies do in fact possess different characteristics than those living farther away. Specifically, the former group has higher WIC participation rates and is more likely to be drawn from the lowest quintile of the SES distribution. However, conditioning on just two neighborhood characteristics—median household income and population density—makes these differences disappear. Such results indicate that the neighborhood environment is responsible for generating the observed family-level differences across the distance distribution, and as long as neighborhood controls are included in Eq. (1), the distance measure is random with respect to background characteristics and

thus can serve as a valid instrument. As previously stated, we incorporate a large number of additional neighborhood characteristics (measured at the census tract- or school-level) to further bolster our confidence in the identification strategy. These variables capture several dimensions of neighborhoods' wealth and resources, urbanicity, racial and ethnic composition, and family structure that are either directly related to human capital investment opportunities or correlated with the relevant attributes of single mothers in our sample. We also include state fixed effects to account for state-level policy, economic, and demographic unobservables that may influence human capital investment decisions.

4. Results

The main results for this analysis are presented in Table 3. We first present coefficients on child care subsidy receipt from OLS regressions of each education and job training outcome. Column (1) presents the raw differences in participation rates between subsidy recipients and non-recipients, while columns (2) through (4) progressively add control variables. Our fullest OLS specification is presented in column (4), in which the observable family and neighborhood characteristics are included along with state fixed effects. Given the concerns associated with the non-random selection into subsidy receipt, we then present estimates from our instrumental variables approach. In particular, the results in column (5) instrument for child care subsidy receipt using the distance measure described previously.

The OLS results consistently point to a positive association between subsidy receipt and maternal participation in education and job training programs. In the models without any controls [column (1)], the coefficient on subsidy receipt implies that recipient mothers are about six percentage points more likely to participate in any work-related activity (full sample mean: 17.1%). It appears that most of this increase is driven by course enrollments at colleges or universities, as opposed to participation in job training programs. Indeed, the results indicate that subsidy recipients are 5.2 percentage points more likely to enroll in school (full sample mean: 13.3%) and only 1.9 percentage points more likely to engage in job training or on-the-job-training programs (full sample mean: 5.5%).

The remaining OLS results [columns (2) through (4)] indicate that adding a rich set of observable characteristics and state fixed effects does not substantially alter the raw participation differences discussed above. In the fullest OLS specification, subsidy recipients are 3.8 percentage points more likely to be engaged in any work-related activity, an estimate that is statistically significant at conventional levels. Course enrollment rates at colleges or universities are 3.6 percentage points higher among recipient mothers, and job training participation rates are approximately one percentage point higher among these women. However, the subsidy coefficient in the job training model is not precisely estimated.

The final column in Table 3, column (5), presents our instrumental variables estimates of the causal effect of child care subsidy receipt on various work-related activ-

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distance interactions. However, given the multicollinearity we encounter between the county indicators and interactions, the second-stage coefficient on subsidy receipt is imprecisely estimated for all outcomes. These results are available from the authors upon request.

Table 3
OLS and 2SLS estimates of the impact of child care subsidy receipt on single mothers' education and job training.

Outcome	N	OLS				2SLS
		(1)	(2)	(3)	(4)	(5)
Any participation in education or job training	3817	0.059***(0.021)	0.047**(0.022)	0.049**(0.022)	0.038*(0.022)	0.147*(0.078)
Enrolled in courses at school or university	3820	0.052**(0.020)	0.042**(0.021)	0.043**(0.021)	0.036*(0.021)	0.126*(0.076)
Job training or on-the-job-training program	3818	0.019(0.012)	0.018(0.012)	0.018(0.012)	0.011(0.012)	0.083*(0.049)
Family controls			X	X	X	X
Neighborhood controls				X	X	X
State fixed effects					X	X

Notes: Each cell presents the coefficient on child care subsidy receipt, along with the standard errors (in parentheses). Standard errors are adjusted for county-level clustering. Results in columns (1) through (4) are derived from OLS, while those in column (5) are derived from 2SLS. The family controls include all variables listed in Table 1. The neighborhood controls (measured at the census tract- or school-level) include the log of median household income, log of population density, percent non-Hispanic white, percent foreign born, percent ages 0–2 and 3–5 living in female-headed households, percent female, percent ages 65 and over, percent of females ages 16 and over employed, percent of children in school eligible for free lunch, percent of kids in school eligible for reduced price lunch, and a dummy variable that equals unity if the child's school received Title I funding. Dummy variables equal to unity are included to account for missing data on the demographic controls.

***	A given coefficient is statistically significance at 1% level.

**	A given coefficient is statistically significance at 5% level.

*	A given coefficient is statistically significance at 10% level.

ities. Relative to the OLS results, our 2SLS estimates imply much larger positive effects of subsidy receipt. Such results suggest that the OLS estimates are biased toward zero. Not surprisingly, the 2SLS standard errors are also larger than in the OLS case, but the coefficient on subsidy receipt is statistically significant for all three work activity outcomes. Participation rates in any work-related activity are 14.7 percentage points higher among subsidy recipients, an effect that is once again driven by the large participation response in school enrollments. Indeed, subsidy recipients are 12.6 percentage points more likely to enroll in school, while these mothers are 8.3 percentage points more likely to engage in job training or on-the-job-training programs.

These results largely mirror the descriptive picture emerging from national administrative data. According to the federal Child Care Bureau (2006), between 75% and 80% of subsidy recipients are engaged exclusively in formal employment. This is consistent with existing empirical studies, which find that CCDF subsidy policy reduces welfare participation rates and increases labor force participation among single mothers (Blau & Tekin, 2007; Herbst, 2010; Tekin, 2007a, 2007b). However, a non-trivial proportion of subsidy recipients are also engaged in various work-related activities, including education and job training. Figures from the Child Care Bureau (2006) suggest that between 10% and 15% of recipients are either participating exclusively in education and job training or combining work with these activities. Results in the study confirm that current subsidy policy encourages human capital generation in addition to quickly moving disadvantaged mothers from welfare to work.

Table 4 investigates the presence of heterogeneous subsidy effects by mothers' skill level and socioeconomic status. In particular, separate 2SLS models are estimated for low- and high-skilled mothers and low- and high-SES families. For the purposes of this study, low-skilled mothers are those with a high school degree or less, while high-skilled mothers are those with at least some

college education. Low-SES families are defined as those in the bottom two quintiles of the ECLS-K SES distribution, and high-SES families are those in the top three quintiles.[16] Such an analysis is important because it addresses an important question regarding the most appropriate way to target child care subsidy benefits. Given that employment rates are substantially lower among low-skilled or low-SES single mothers, one might expect child care subsidies to have a larger participation effect on human capital activities among these women.[17] By encouraging contemporaneous school enrollment or job training, subsidy policy might therefore increase future employment rates among formerly low-skilled mothers.

Consistent with this intuition, we find that child care subsidies increase participation in work-related activities substantially more among low-skilled and low-SES single mothers. For example, subsidy receipt increases the likelihood of any participation in work-related activities by 19.6 percentage points among low-skilled mothers, while the participation response is 11 percentage points (and imprecisely estimated) among high-skilled mothers. Not surprisingly, the greatest participation response among low-skilled mothers is estimated for school enrollment, whose participation rate is expected to increase 17.2 percentage points—compared to 12.8 percentage points among high-skilled mothers—after receiving a child care subsidy. On the other hand, subsidized child care does not appear to differentially influence job training or on-the-job-training among low- and high-skilled mothers. In fact, the subsidy coefficients are small in magnitude and statistically insignificant for both sets of women. The

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[16] The SES index was constructed by ECLS-K staff and comprises parental education, occupation, and family income.

[17] In our ECLS-K sample, 66% of low-skilled single mothers are employment, compared to 83% among high-skilled mothers.

Table 4
Differential effects of child care subsidies by mothers' skill level and family socioeconomic status.

Outcome	(1) Low-skilled	(2) High-skilled	(3) Low SES	(4) High SES
Any participation in education or job training	0.196***	0.110	0.115*	0.077
	(0.070)	(0.097)	(0.061)	(0.097)
Enrolled in courses at school or university	0.172***	0.128	0.108*	0.085
	(0.066)	(0.093)	(0.060)	(0.097)
Job training or on-the-job-training program	0.040	0.029	0.023	0.034
	(0.054)	(0.059)	(0.047)	(0.055)

Notes: All models are estimated using 2SLS. Each cell presents the coefficient on child care subsidy receipt, along with the standard errors (in parentheses). Standard errors are adjusted for county-level clustering. Low-skilled mothers are those with a high school degree or less. High-skilled mothers are those with at least some college education. Low SES families are those in the bottom two quintiles of the ECLS-K SES distribution. High SES families are those in the top three quintiles of the ECLS-K SES distribution. The family controls include all variables listed in Table 1. The neighborhood controls (measured at the census tract- or school-level) include the log of median household income, log of population density, percent non-Hispanic white, percent foreign born, percent ages 0–2 and 3–5 living in female-headed households, percent female, percent ages 65 and over, percent of females ages 16 and over employed, percent of children in school eligible for free lunch, percent of kids in school eligible for reduced price lunch, and a dummy variable that equals unity if the child's school received Title I funding. State fixed effects are included in all models. Dummy variables equal to unity are included to account for missing data on the demographic controls.

*** A given coefficient is statistically significance at 1% level.
* A given coefficient is statistically significance at 10% level.

2SLS results disaggregated by family SES are largely consistent with those derived from maternal education. It must be noted that the results in Table 4 should be interpreted, as the criteria we use to create these sub-groups are likely to be endogenous to human capital investment decisions.

5. Robustness analyses

In the final set of results, which are shown in Table 5, we check the robustness of the main findings by experimenting with several changes to the baseline specification. We begin by estimating models that omit the maternal education controls in order to avoid their potential endogeneity with human capital investment decisions. As shown in column (1) of Table 5, the subsidy coefficients change very little when we make this exclusion. In results not reported here, we also experiment with omitting the control for WIC participation. Recall that this variable is included in the baseline specification to account for confounding family resources that are correlated with mothers' participation decisions. In particular, since the ECLS-K does not allow us to construct a measure of non-wage income, we include the indicator of WIC participation as a reasonable proxy for these sources income. However, this control may be endogenous. Omitting the WIC control leaves our subsidy estimates largely unchanged. We then attempt to more explicitly account for familial economic resources by adding a control for (the log of) family income. Although similar concerns over endogeneity arise, our results are robust to the inclusion of family income.

The validity of our instrumental variables strategy depends on the assumption that the travel distance is uncorrelated with single mothers' unobserved location preferences after conditioning on individual and census-tract level neighborhood controls as well as state fixed effects. To reiterate, note that differences in the observed characteristics of children and mothers are unrelated to the distance measure after conditioning on the neighborhood environment in which families reside. To further guard against the confounding effects of endogenous residential location choices, we utilize an item in the ECLS-K that asks whether a given family chose its current home location based on the attributes of local schools. Assuming that the demand for certain school characteristics is highly correlated with parental preferences regarding other public services, including this variable in the model should further purge our 2SLS estimates of bias resulting from unobserved location choices. As shown in column (2), our subsidy estimates are once again robust to the addition of this preference variable in the specification.

Another concern regarding the validity of our instrumental variables strategy is that social service agencies might choose to locate in neighborhoods that contain high concentrations of potential clients. To guard against the endogeneous location preferences of social service agencies, we condition on characteristics of the neighborhood environment in which social service agencies are located. These characteristics—all of which are measured at the census tract-level—include the (log of) median household income, percent foreign born, percent ages 65 and over, percent female, and percent of employed females ages 16 and over. These variables are intended to account for the unobserved determinants of social service agencies' decision to locate in certain neighborhoods. As shown in column (3) of Table 5, the estimated effects of subsidy receipt are robust to these additional neighborhood characteristics.

Although we cannot test directly whether the distance instrument should be excluded from the human capital model, we offer a final piece of indirect evidence on its validity by conducting a falsification test. If the identifying assumption is valid, then variation in subsidy receipt explained by the distance measure should not reflect variation in the unobserved neighborhood factors that are correlated with maternal decisions about education and job training. If this is the case, then predicted subsidy receipt should not affect education and job training outcomes

Table 5
Robustness checks.

Outcome	(1) Omit education	(2) Endogenous location	(3) Agency neighborhood characteristics	(4) Include current/lagged employment	(5) Omit non-in-person applications
Any participation in education or job training	0.157[**](0.078)	0.143[*](0.077)	0.154[**](0.078)	0.144[*](0.077)	0.144[*](0.084)
Enrolled in courses at school or university	0.139[*](0.076)	0.120(0.075)	0.145[*](0.076)	0.131[*](0.075)	0.110(0.080)
Job training or on-the-job-training program	0.082[*](0.048)	0.084[*](0.048)	0.088[*](0.052)	0.076(0.049)	0.110[**](0.055)

Notes: All models are estimated using 2SLS. Each cell presents the coefficient on child care subsidy receipt, along with the standard errors (in parentheses). Standard errors are adjusted for county-level clustering. Column (1) uses the log of the inverse distance to social services agencies as the basis for the instrument. Column (2) omits the controls for maternal education. Column (3) adds a control for whether the family chose its current home location based on the attributes of local schools. Column (4) adds controls for the (log of) median household income, percent foreign born, percent ages 65 and over, percent female, and percent of employed females ages 16 and over. The family controls include all variables listed in Table 1. The neighborhood controls (measured at the census tract- or school-level) include the log of median household income, log of population density, percent non-Hispanic white, percent foreign born, percent ages 0–2 and 3–5 living in female-headed households, percent female, percent ages 65 and over, percent of females ages 16 and over employed, percent of children in school eligible for free lunch, percent of kids in school eligible for reduced price lunch, and a dummy variable that equals unity if the child's school received Title I funding. State fixed effects are included in all models. Dummy variables equal to unity are included to account for missing data on the demographic controls.

[**] A given coefficient is statistically significance at 5% level.
[*] A given coefficient is statistically significance at 10% level.

among women who are categorically ineligible for a child care subsidy. An obvious choice is to look at low-skilled women without children (Blau & Tekin, 2007). Unfortunately, the ECLS-K is a dataset designed to track child well-being. Therefore, we focus the falsification test on *two-parent families* in the *top two quintiles* of the SES distribution. To implement this test, we first estimate the first-stage subsidy receipt equation on the sample of single mothers in order to calculate a predicted probability of subsidy receipt for the subset of two-parent families in the top SES quintiles. We then include this variable in the human capital regressions. This falsification test provides no evidence against the validity of our identification strategy: in no case do we find that predicted subsidy receipt influences the education or job training decisions of women in high-income, two-parent families. It is likely that single mothers' employment decisions are correlated with subsidy utilization as well as decisions regarding education and job training investments. Perhaps the decision to attend a job training program reflects a preference for employment rather than a consequence of subsidy receipt. Given the difference in the timing of subsidy receipt and the outcome measures, it could also be the case that subsidy receipt first caused an increase in employment, which might have then encouraged mothers to attend school or participate in job training. Until this point, we have not controlled for maternal employment because it is likely to be endogenous. Nevertheless, we estimate the human capital models with controls for contemporaneous as well as lagged employment status. As shown in column (4) of Table 5, the coefficient estimates change very little after controlling for these two variables, although the estimate in the job training model becomes less precise. We obtain similar results when we estimate the model with only the indicator of lagged employment included. This suggests that single mothers' decision to participate in job training reflects, in part, strong preferences for employment rather than a desire to receive training.

A growing number of states allow families to apply for child care subsidies via the mail, online, or over the telephone (Herbst & Tekin, 2010b). A potential concern is that the travel distance to social service agencies is less meaningful for parents in these states. However, these non-in-person application options were less common in 1998, when the ECLS-K fall of kindergarten interview was conducted. In fact, only 14 states in our sample allowed parents to *request* subsidy applications through mail, telephone, or email, and another five states allowed them to *complete* the subsidy application via mail or telephone.[18] Nevertheless, to test the sensitivity of our main results to the exclusion of states that permit non-in-person applications, we estimate the model only on those single mothers residing in a state that required in-person applications in 1998. As shown in column (5) of Table 5, our results are quite similar to those in Table 2. The similarity of these results to our main estimates is not surprising because, although some parents may not be required to make an office visit to apply for child care assistance, there are numerous other factors that may require in-person visits both initially and later at recertification (Adams, Synder, & Sandfort, 2002).[19] In addition, it is conceivable that single mothers may not have sufficient resources or the knowledge to handle the application process through online or telephone interactions. Therefore, it is likely that distance was still an important determinant of subsidy utilization for these families as of the late-1990s. In fact, Herbst and Tekin (2010c) show that the distance measure is associated with a statistically significant reduction in subsidy utilization irrespective of whether families must make personal

[18] These states are, respectively, Alaska, Arizona, Arkansas, Kansas, Louisiana, Maine, Michigan, Missouri, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, and Washington; and Maine, Michigan, Oregon, Texas, and Washington.
[19] These reasons include lack of trust by parents in the subsidy system, errors made by parents or case workers, and visits required by case workers to provide additional eligibility documentation.

visits to the social service agency in the county in which they reside.[20]

6. Conclusion

Child care subsidies constitute a key policy instrument used by the government to facilitate single mothers' transition from welfare dependence to economic self-sufficiency. Despite the potential importance of human capital investments in increasing economic self-sufficiency among low-skilled individuals, the emphasis of state welfare and child care programs continues to be immediate job placement, with little attention given to the quality of these jobs and career advancement. Consequently, previous studies focus almost exclusively on the employment effects of child care subsidies, documenting sizeable positive effects. However, the CCDF allows parents to utilize child care subsidies for other work-related activities, including attending school or engaging in job training programs. The literature focusing on these outcomes is under-developed. In this paper, we attempt to fill this gap by analyzing the impact of child care subsidy receipt on the decision of single mothers to participate in education and job training. Using data from the ECLS-K, our results suggest that these subsidies do in fact encourage single mothers to engage in activities involving human capital investment.

The employment focus of the current child care subsidy system is based on the assumption that the path to success in the labor market begins with accepting any job, even one that may not pay well and may not be full-time (Brown, 1997). This approach assumes that women who take low-wage and part-time jobs will eventually move into higher-wage and full-time jobs (Pavetti & Acs, 2001). However, a reasonable interpretation of the empirical evidence suggests that low-skilled workers do not enjoy large wage gains from direct work experience. For example, Holzer and LaLonde (2000) find that the most important types of job mobility in terms of generating wage growth are relatively uncommon among low-skilled women. In addition, studies focusing on welfare leavers show that employment in low-paying jobs with little wage growth is the norm (Cancian, Haveman, Meyer, & Wolfe, 2000; Harris, 1996; Peterson, Xue, & Hoses-DeWeever, 2002). On the other hand, our results suggest that even a work-first child care subsidy regime—emphasizing rapid movement into employment—can assist low-income mothers in using child care benefits as a pathway to upgrade skills and human capital. This finding is an encouraging sign for the success of welfare reform in helping the needy population achieve self-sufficiency in the long-run.

Appendix A.

Table A1 The determinants of child care subsidy receipt.

Variable	Coefficient	Standard error
Mother's age	−0.003	0.007
Mother's age squared	0.000	0.000
Mother is black	0.014	0.019
Mother is Hispanic	0.003	0.024
Mother is other race/ethnicity	−0.051	0.024[**]
Mother has high school/GED	0.052	0.016[***]
Mother has some college	0.083	0.017[***]
Mother has B.A.+	0.087	0.024[***]
Child has one sibling	0.038	0.013[***]
Child has two or more siblings	0.084	0.019[***]
Home language is English	0.005	0.027
Household size	−0.031	0.016[*]
Household size squared	0.003	0.001[*]
Mother or child ever received WIC	0.116	0.015[***]
Urban residence	−0.060	0.048

Notes: The model is estimated using OLS. $N = 3848$. Standard errors (in parentheses) are adjusted for county-level clustering. The neighborhood controls (measured at the census tract- or school-level) include the log of median household income, log of population density, percent non-Hispanic white, percent foreign born, percent ages 0–2 and 3–5 living in female-headed households, percent female, percent ages 65 and over, percent of females ages 16 and over employed, percent of children in school eligible for free lunch, percent of kids in school eligible for reduced price lunch, and a dummy variable that equals unity if the child's school received Title I funding. State fixed effects are included, as are the parent-specific distance instruments. Dummy variables equal to unity are included to account for missing data on the demographic controls.

[***] A given coefficient is statistically significance at 1% level.

[**] A given coefficient is statistically significance at 5% level.

[*] A given coefficient is statistically significance at 10% level.

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[20] Note that states allowing in-person applications may be different in some other respects from those not allowing in-person applications. For example, the former may have more technologically advanced residents or greater resources not only in the provision of child care assistance, but also in assisting low-income families in other capacities, including the quality and availability of education and job training. Therefore, limiting the sample this way may introduce an endogeneity problem.

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