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Rural Gaps in Participation in Early Childhood Education

Judy A. Temple

While state government spending on early education has grown in recent years, accessibility of preschool programs for rural children remains a problem. Using census-tract data from a nationally-representative data set on U.S. children, multinomial logit estimation reveals significant differences in early education experiences between rural and nonrural children. Both rural children and children of less-educated mothers are less likely to participate in preschool. This paper concludes by discussing the appropriate role of local, state, or federal governments in funding rural preschool programs. While early educational investments are being touted as effective economic development tools, the nature of the positive externalities associated with preschool makes it unlikely that any single rural community would invest in high-quality programs without state or federal assistance.

Key Words: early education, human capital, preschool, rural education

JEL Classifications: I2, R0, H4

Although there is strong evidence that preschool education increases school readiness and may have longer-term effects on educational attainment, many children enter kindergarten without any prior involvement in formal early educational programs. These children are more likely to come from economically-disadvantaged families (Bainbridge et al., 2005) and/or from families residing in rural areas where access to good quality early education programs is limited (Grace et al., 2006). Researchers have found that gaps in test scores and other measures of skills between more- and less-advantaged children are present at kindergarten entry and widen over time (Heckman, 2008). This study investigates the determinants of participation in early education programs

for children in the year before kindergarten and discusses the likely consequences of poor school readiness for rural children and rural communities.

Importance

Enrollment in early education programs, especially those funded by state preschool initiatives, has been growing in recent years. While Barnett et al. (2008) report that over half of all 4-year-olds attend public preschools in nine states, a number of states still invest very little in early education. In the South, however, a number of states have chosen to place a high priority in expanding preschool access by funding large-scale public programs. The state of Georgia was the first in the United States to offer state-funded prekindergarten to all students regardless of income. Their program began in 1993 and is funded by the state lottery. More recently, other states have created public prekindergarten programs. Some of the

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southern states include Florida, West Virginia, and South Carolina. Not all programs are of equal quality, however, and early childhood researchers specifically have noted concerns about the quality of programs like Florida's that satisfy relatively few quality standards thought to be important by early education researchers (Barnett et al., 2008). The details of various state initiatives including expenditures, eligibility, and program quality characteristics are described in annual reports published by the National Institute on Early Education and Research.

Despite the fact that preschool programs for 4-year-olds are the fastest growing category of public spending on education (Barnett and Yarosz, 2004), children from lower-income families and children from rural areas are less likely to participate in early education programs. There are important consequences for children and schools that are relevant for policymakers and residents of rural areas. First, some children who enter elementary school not ready for school end up struggling throughout their educational career with lower achievement and a higher probability of high school dropout. This results in lower earnings for these children in adulthood and also may generate social costs. Research from longitudinal studies of high-quality preschool programs provided to children from economically-disadvantaged families indicates that these interventions generate significant social benefits in terms of higher earnings of participants, higher tax revenues, and lower costs to the public for criminal behavior and income support programs (Heckman and Masterov, 2007; Temple and Reynolds, 2007).

Second, poor school readiness increases schooling costs through higher rates of grade repetition and in higher special education spending (Temple and Reynolds, 2007). Local school districts bear a significant portion of these school remediation costs, which can result in higher local property taxes and adverse consequences for school quality as financial resources that could be used to reduce class sizes or provide higher salaries to teachers are used to address the consequences of early learning difficulties (e.g., Belfield, 2004).

Variation in Preschool Enrollment Rates between Rural and Nonrural Areas

Information from a nationally-representative data set on childhood called the Early Childhood Longitudinal Study—Kindergarten Cohort (ECLS-K) is used to investigate differences in early education participation before kindergarten entry. The ECLS-K data have been used in a number of studies of the achievement of elementary education students in the early years of formal schooling. Parents are asked at kindergarten entry about the education and care arrangements that were made for the child in the year before kindergarten in 1998. The findings reported in this study incorporate geocoded information on the locality of individual students by census tract from the restricted version of the ECLS-K data to examine the variation across rural and nonrural areas in early education enrollment.

Although the public access version of the ECLS-K data set contains some information on rural locations, this public information comes from a general question asked to a school district administrator about the rural, suburban, or urban location of the school district. The restricted data allows the rurality indicators to be measured based on characteristics of the census tract in which each student resides. Cromartie and Bucholtz (2008) discuss various ways of describing rurality. Here the rural-urban codes created by the Economic Research Service of the United States Department of Agriculture (USDA) are employed (USDA, 2005). These Rural Urban Commuting Area (RUCA) Codes range from 1 to 10 and delineate metropolitan and nonmetropolitan census tracts based on location within urbanized areas, small towns, and rural areas following the U.S. Office of Management and Budget definitions of urban and rural places. Instead of designating rural areas at the county level, the RUCA codes utilize information on commuting patterns within a census tract to better delineate the rurality of each location based on labor market commuting patterns between rural and nearby urban areas. In the estimation reported below, the rural designation is assigned to census tracts given a RUCA code of 4 to 10.

Interestingly, the subjective rural designation made by the school administrator for the district as a whole generates a slightly higher count of rural students in the data set. Using the sample of 14,539 used in the analyses below and using the sampling weights provided in the ECLS-K data set, 20% of students were considered rural using the school administrator's definition while just under 18% of the students are considered rural using the RUCA codes based on census tracts. This similarity in means masks the actual differences between the two measures. When looking more closely at the data to see how the two measures match up, it turns out that 30% of the students are assigned different rural indicators under the two measurement schemes. This current paper appears to be the first to illustrate rural/nonrural differences in preschool participation using

student-level census tract information rather than the subjective district-level designation provided in the public use data. A recent publication by Grace et al. (2006) containing analyses of various rural versus nonrural differences in education outcomes and student and school characteristics employs the public use definition of rural as provided by the school administrator.

Table 1 highlights some differences across rural and nonrural children in their participation in early childhood education programs in the year before kindergarten. From a larger set of parental responses to questions about early education and child care decisions, I created five categories of early education and care. These categories are mutually exclusive, so that the proportions across each row sum to one. The categories of preschool or childcare center

Table 1. Early Education Enrollment in the United States by Type and Rurality

	Prekindergarten	Preschool or Child Care Center	Head Start	Relative or Nonrelative Home Care	Parental Care Only
Total	0.18	0.47	0.10	0.10	0.15
Nonrural	0.20	0.46	0.10	0.10	0.14
Rural	0.10	0.50	0.10	0.13	0.18
Remote rural	0.13	0.47	0.08	0.13	0.19
Lowest income quartile					
Nonrural	0.16	0.48	0.11	0.10	0.15
Rural	0.06	0.55	0.09	0.12	0.19
Remote rural	0.09	0.50	0.07	0.17	0.17
Mother with college degree	0.15	0.68	0.02	0.07	0.08
Nonrural	0.17	0.66	0.02	0.07	0.08
Rural	0.07	0.73	0.01	0.09	0.09
Region					
Midwest	0.20	0.48	0.10	0.09	0.12
Rural Midwest	0.08	0.65	0.07	0.08	0.12
Northeast	0.17	0.51	0.08	0.11	0.15
Rural Northeast	0.13	0.52	0.10	0.13	0.12
West	0.13	0.45	0.11	0.12	0.19
Rural West	0.07	0.49	0.09	0.14	0.22
South	0.20	0.44	0.11	0.09	0.14
Rural South	0.11	0.45	0.13	0.13	0.18

Data are from the Early Childhood Longitudinal Study—Kindergarten cohort for approximately 1998. Means were computed using sample weights. Rural consists of RUCA codes 4–10 while Remote Rural consists of RUCA code 10. Total sample is 14,539. The four regions are defined using the standard Census Bureau classification. The Northeast contains nine states, the South contains 16 states, Midwest contains 12 states, and the West contains 13 states.

or prekindergarten include children who participated in these programs at least twice a week. In total, 18% of the children had participated in prekindergarten programs while another 47% had either enrolled in preschool or attended a child care center. Another 10% participated in the federally-funded Head Start preschool program. The children included in parental care only or relative or nonrelative home care (including home-based daycares) did not participate in preschool (at all or more than once a week). Because this information came from parental reports, it is possible that there is some overlap between prekindergarten and preschool and between preschool and enrollment in a childcare center. Prekindergarten programs differ from regular preschool in that prekindergarten often is offered by public school systems, but it is possible that some parents do not distinguish between the two terms. For this research, prekindergarten was kept distinct from preschool because of the great variation across regions in the availability of the former and the importance of prekindergarten programs in recent state policy initiatives. At the same time, the decision was made to merge the categories of preschool with daycare center because many daycare centers offer some preschool-like programming for 4-year olds.

Adding the last two columns together in each row gives a measure of the proportion of children *who did not participate* in an early education program in the year before kindergarten. This amount is 25% for all U.S. children. There is notable regional variation. The proportion of children with no early education experience before entering kindergarten is significantly higher for children in rural and remote rural areas (31 and 32%) and slightly higher (34%) for remote children in low-income families. Across regions, both the rural West and South have higher rates (36 and 31%) of rural children having no participation in formal early education settings.

Table 1 also provides information on rural gaps in preschool participation by family income and by maternal education. The income variable used in this study is an income-to-needs ratio which takes into account family income

and the size of the household and compares that to the level of income that the U.S. Department of Health and Human Services suggests is required to avoid poverty. This income-to-needs ratio is commonly used to represent family income in studies based on ECLS-K data (e.g., Fryer and Levitt, 2004; Magnuson, Ruhm, and Waldfogel, 2007). For rural students living in families in the lowest quartile of the income-to-needs ratio, 31% enter kindergarten without a preschool education. Using the most remote and isolated definition of rurality based on census tracts with a RUCA code of 10, it can be seen that 34% of those students enter kindergarten without prior preschool participation. Because only 2% of the sample live in these remote rural areas, the remainder of the analysis focuses on the broader definition of rural (with RUCA codes 4–10). Maternal education makes a difference in enrollment decisions as mothers with college degrees are more likely to enroll their children in preschool regardless of rural status.

Table 2 provides descriptive statistics for the explanatory variables that will be used to estimate the determinants of the early education and care decision in the year before kindergarten and shows how these factors differ across rural and nonrural students. The variables that are used to explain why some students get an early formal education and why some do not include family income, child gender, a series of race and ethnicity indicators, and parent and family characteristics. As will be explained below, some of these explanatory variables are considered as risk factors for low school readiness and other variables reflect the families need for child care. There are statistically significant rural/nonrural differences for the majority of explanatory variables. Note that the omitted category for race is white and the omitted category for region is West.

The determinants of the various early education and care decisions are estimated using a multinomial logit model that considers each of the five unordered choices (Greene, 2007). For the i th individual, y_i is the observed early education or care outcome out of a total of J possibilities. Assuming that the J choices are numbered zero to five, the model can be written as:

Table 2. Means (standard deviations) of Explanatory Variables by Rurality

	Rural	Nonrural
Income to needs ratio	2.51 (2.75)	3.11** (3.37)
Boy	0.51 (0.50)	0.51 (0.50)
Black	0.09 (0.29)	0.18** (0.38)
Hispanic	0.12 (0.32)	0.22** (0.42)
Asian	0.01 (0.11)	0.03** (0.18)
Mother with college degree	0.25 (0.43)	0.23 (0.42)
Single parent family	0.28 (0.42)	0.22 (0.41)
Mother was teen parent	0.16 (0.37)	0.14** (0.35)
# of children in home < 18	2.37 (1.11)	2.49** (1.19)
# of people in home \geq 18	2.02 (0.66)	2.03 (0.69)
Mother ever worked 0 to K	0.77 (0.42)	0.76 (0.43)
# of living grandparents	3.42 (1.05)	3.32** (1.08)
Northeast	0.12 (0.33)	0.18** (0.39)
Midwest	0.13 (0.34)	0.28** (0.45)
South	0.33 (0.47)	0.34 (0.47)

N = 14,539 for total sample. ** denotes that rural/nonrural mean differences are statistically significant at the 1% level.

$$(1) \quad \text{Pr}(y_i = j) = \frac{\exp(X_i B_j)}{(1 + \sum_j^5 \exp(X_i B_j))} \quad \text{for } j = 1, 2, 3, 4 \text{ and}$$

$$(2) \quad \text{Pr}(y_i = 0) = 1 / (1 + \sum_j^5 \exp(X_i B_j))$$

The objective is to estimate the unknown parameters contained in B_j . The equations that are estimated provide the probabilities for the set of five choices for a family with characteristics described in the vector X_i . Some of these covariates represent maternal and family characteristics that often predict poorer school performance. Maternal characteristics such as low levels of education, teenager at birth of child, unmarried status, and a large number of other children in the home are frequently used to construct risk indices for child well-being and school performance (e.g., Magnuson, Ruhm, and Waldfogel, 2007; Temple and Reynolds, 2007). Policymakers may find it important to understand how early education decisions are correlated with these characteristics as the consequences of not participating in early education before kindergarten are likely to be more serious for students from more disadvantaged backgrounds. Additional variables such as maternal work experience, the presence of other adults in the home, and relationships with grandparents help explain the need for different types of childcare.

Table 3 contains results from the multinomial logit estimation of the factors associated

with the parents' choice among the five early education and care options. The estimates reported in the table are the average of the marginal effects for each individual child. These marginal effects sum to zero across the row as they show the effect of a one unit change in a regressor on the various choice probabilities for the five possible outcomes. As in the previous tables, the data were weighted by the appropriate sample weight so that the sample is representative of all U.S. children entering kindergarten. The first row shows that there are clear rural/nonrural differences in early education and care experiences for U.S. children. Compared with nonrural children, children in rural areas are less likely to participate in prekindergarten but somewhat more likely to be enrolled at least twice a week in a regular preschool or childcare center. Specifically, rural children have almost a 12 percentage point lower probability of enrolling in a prekindergarten program. They have a 3.8 percentage point higher probability of being in parental care only. Overall, rural children are more likely than nonrural children to have no participation in formal early learning programs as they are more likely to be taken care of by relatives or others in home daycares or by their own parents. Children from higher income families are more likely to be enrolled in prekindergarten.

Table 3. Multinomial Logit Estimation of the Early Education and Care Decision at Age 4

	Prekindergarten	Preschool or Child Care Center	Head Start	Relative or Nonrelative Home Care	Parental Care Only
Rural	-0.119**	0.052**	0.003**	0.025**	0.038**
Income to needs ratio	0.008**	-0.005**	-0.000**	-0.002*	-0.002
Boy	-0.006	0.018*	-0.005*	0.001	-0.008
Black	0.045**	-0.024*	-0.013*	0.001	-0.010
Hispanic	-0.047**	0.023*	0.002*	0.009	0.014
Asian	-0.032	0.026	0.017	0.005	-0.015
Mother with college degree	-0.011**	0.259**	-0.147**	-0.029**	-0.072**
Single parent family	-0.013	-0.049**	0.073**	0.030**	-0.042**
Mother was teen parent	-0.018*	0.024*	0.004*	0.003	-0.013
# of children in home < 18	0.006**	-0.047**	0.019**	-0.002	0.024**
# of people in home \geq 18	-0.007	-0.022**	-0.000**	0.022**	0.007
Mother ever worked 0 to K	-0.004	0.035**	-0.023**	0.106**	-0.115**
Close to grandparents	0.005	0.018**	-0.012**	0.000	-0.010**
Northeast	0.017	0.040**	-0.024**	-0.011	-0.022**
Midwest	0.059**	0.023*	-0.002*	-0.024**	-0.060**
South	0.052**	0.003	-0.000	-0.031**	-0.024**
Constant	-0.085**	0.307**	-0.061**	-0.194**	0.034

N = 14,539. Estimates reported are the average of individual marginal effects. ** denotes significance at the 1% level (* for 5% level) for a two-tailed test.

Maternal education is a strong predictor of early care and education decisions. Consistent with the mean differences reported in Table 2, the results of this multivariate analysis indicate that children with more highly-educated mothers are more likely to have participated in preschool programs before kindergarten entry. Children of mothers' with a college degree have a 7 percentage point lower probability of being in parental care only in the year before kindergarten. Importantly, children with college-educated mothers have a 25 percentage point higher rate of participation in a preschool or child care center program. Given that even without preschool experience maternal education is known to be a predictor of school readiness, this suggests that the unequal distribution of early education and care participation experiences may serve to exacerbate gaps in school readiness for children with college versus noncollege educated mothers. Working mothers appear to be more likely to have children who are taken care of by relatives or by others in a home-based daycare. For mothers who indicated that they had worked at least at some point during the child's

first 5 years, they have a 10.6 percentage point higher probability of relying on noncenter based care

Significant regional differences exist as children residing in both the Midwest and the South are more likely to participate in early education programs. Compared with children residing in the western part of the United States, children in both of these regions are more likely to participate in prekindergarten programs and are less likely to be taken care of solely by parents or by others in home daycare settings. In the South, for example, children have a 2.4 percentage point lower probability of receiving parental care only. In both the South and the Midwest, children are more likely to participate in prekindergarten programs.

Conclusion

Early education experiences can benefit children by improving school readiness and fostering both cognitive and noncognitive skills that may ultimately have an impact on educational attainment and economic well-being (Heckman, 2008). While most of the research

on the longer-term benefits of early education has focused on urban children, certainly children residing in rural areas could also be expected to benefit from good quality early education programs. The quality of rural schools could also improve as fewer children enter school requiring costly remediation. This paper examines differences in early education and child care decisions for children in the year before kindergarten. In addition to establishing the existence of rural gaps in participation rates in various types of preschool and care settings, this research demonstrates how early education decisions vary by various family socioeconomic characteristics. Both rural children and children with less educated mothers are less likely overall to participate in preschool programs in the year before kindergarten.

In addition to providing benefits to students and to local schools, investments in early education for rural students could potentially serve as an engine for local economic development. Policies to promote human capital investments for young children have caught the attention of the business community both nationally and at the state level because of the possibility that early education investments may promote the productivity of firms and ultimately lower taxes. Taking into account the social benefits of crime reduction, higher tax revenues, and lower reliance on government transfer programs found in a long-term follow up of the well-known Perry Preschool program that was offered to disadvantaged youth in the 1960s, Rolnick and Grunewald (2003) estimate the internal rate of return from investments in the high-quality preschool program to be over 15%. Economic development researchers have started to consider preschool investments as part of a portfolio of possible development tools. At the state level, Bartik (2006) compares the effectiveness of preschool investments to traditional development subsidies. He claims that both types of state government development strategies can increase state earnings, but from a national perspective preschool investments are more likely to be effective in increasing total earnings. Unlike with preschool investments, a sizeable portion of the benefits from state-level business subsidies arises from

labor and capital merely moving from one state to another. Of course, expansion of early education and care programs also offers additional economic development benefits through facilitating greater labor force participation by women (Warner, 2006).

While the general importance of education to rural economic development has been discussed by various researchers (Beaulieu and Gibbs, 2005; Gibbs, 2005; and Kilkenny and Johnson, 2007), some difficulties exist in making the case for increased public investments in rural preschool programs. While policies that increase access to high quality early education programs in rural areas may, in general, lessen the adverse consequences of rural poverty, improve the quality of rural schools, and help attract and retain desirable employers and skilled workers, long-term studies of the effects of preschool reveal that a large source of the high rate of return for preschool consists of reduction in social costs of crimes, higher earnings for program participants, and higher tax receipts resulting from these higher earnings (Temple and Reynolds, 2007). Given the nature of the positive externalities resulting from these investments in human capital, there may not be an incentive for a particular rural community or school district to invest in preschool education programs. To the extent that a significant portion of the benefits of early education are not realized until the preschool participants reach adulthood, the existence of significant population mobility (especially for more educated rural residents) makes it unlikely that any single rural community would be able to recover enough of the future benefits to cover the upfront costs. Hence early education policies are more appropriately made by states or by the federal government.

As more data become available on early education participation, more research is needed to see how the access of preschool programs for rural children has changed in recent years given the increases in state-funded preschool programs offered in many states. More recent data are becoming available soon from a younger cohort of the Early Childhood Longitudinal Study who were born in 2001. The 2010 Census

of the Population also will contain detailed information about preschool participation. Because of the accessibility issues for rural children, especially those in more remote locations, it is possible that expansions in state-funded preschool programs may widen existing rural gaps in participation if states find it easier to serve urban and suburban students.

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