Community Matters in China

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ABSTRACT

In China, a growing awareness that many areas have been left behind during an era characterized by market reform has raised concerns about the impact of community disadvantage on schooling. In this paper, I investigate whether villages exert distinct influences on student achievement. Building on these results, I explore the relationship between student achievement and resources present in the community. Results indicate that children who live in communities with higher levels of economic and social resources have higher mathematics scores, on average.

INTRODUCTION

In the past decade, researchers have reported a global trend toward the decentralization of school finance and management by shifting responsibilities from central governments to local communities and schools. This has raised important questions about whether differences across communities might be linked with disparities in children's schooling (Bray, 1996; Hanson, 2000).

Local governments in many nations have become responsible for the provision and administration of basic education, and in turn, are expected to raise their own funds, hire their own teachers, and run local schools (Hanson, 2000; Patrinos and Lakshmanan, 1997; Bray, 1996). In this way, decentralization policies have fashioned community schools that are even more local—now tied to community economies, leadership, and social organizations (Cheng, 2001). The increasingly local nature of schooling is sometimes credited with increasing real national expenditures for education, inspiring educational innovation, and encouraging community involvement (Tsang, 1996; Bray, 1996; Eskeland and Filmer, 2002). But this praise must be tempered by evidence from some nations, such as China, that shows concurrent increases in educational inequality (Tsang, 1996; Tsang, 2003; Park et al, 2003).

In China there is a growing awareness that many areas have been left behind during an era characterized by market reform, which has raised concerns about the impact of community disadvantage on schooling (West and Wong, 1995; Ross and Lin, 2002; Adams, 2001; Adams and Hannum, 2005). In recent years, researchers have linked community economic indicators to tangible measures of education, such as enrollment and the provision of schools (Connelly and Zheng, 2003; Adams, 2001; Park et al, 2003; Hannum, 2003). Evidence has also established a connection between both province and county-level economic conditions and local investment in education (Park et al, 2003).

Moreover, recent research indicates that both local revenue and community donations vary across provinces, within provinces, and sometimes even within counties

(Park et al, 2003; Tsang, 2003). While researchers have successfully documented the extent of variation in community financial resources available for schooling in China, little is known about whether differences in these economic resources directly influence student achievement. Moreover, the connection between social conditions in the community and local schooling is poorly understood.

This paper examines the links between community conditions and student achievement in one rural interior province in China. In it I address the following questions: First, after controlling for child background, does student achievement depend on where the child lives? Second, do children who live in villages with better economic and social conditions achieve more? If so, does the effect of social conditions differ depending on the economic resources available in the community?

I begin by describing a framework for understanding the effect of community conditions on schooling. Next I describe educational reform during the decentralization era in China, in order to provide a backdrop for a synthesis of studies that have linked dimensions of communities and educational outcomes in the Chinese context. This is followed by a presentation of my data and methodological approach, and concludes with an analysis of the findings.

The results of this study offer additional insights into the linkages between where children live and their achievement in school. The data provides empirical evidence of the connection between community conditions and local student achievement and also the specific dimensions of communities that influence achievement. As educational policies focused on decentralization intermingle with the financial limitations of an economy in transition, research that reveals significant geographic inequalities becomes increasingly important to policymakers in China and abroad who are concerned with reducing educational inequality and improving the quality of schooling in poor areas.

BACKGROUND AND CONTEXT

The Importance of Place: Understanding the Effect of Communities on Schooling

In the last decade, several researchers have linked the socioeconomic and structural differences across communities with the individual outcomes of the children who live in them (Duncan, 1994; Dornbusch et al, 1991; Garner and Raudenbush, 1991). Even more notable is research that suggests that the influence of communities on children's social welfare is *separate* from family characteristics. For example, Ho and Willms' (1996) study of eighth graders in the United States found that parental participation measured at the school level had a positive effect on student achievement, net of individual parental participation, indicating that even those children whose parents did not participate in school activities achieved higher scores when they went to a school where a greater percentage of community parents were involved. Similarly, using data from the National Education Longitudinal Study (NELS), Pong (1998) also found that strong social networks within a school positively affected mathematics achievement. Strikingly, one study of adolescent females which used the Panel Study of Income Dynamic suggested that neighborhood effects on school leaving sometimes rivaled the influence of family characteristics (Brooks-Gunn et al, 1993).

Research also demonstrates that community economic indicators—such as mean community income and the percentage of families in poverty—exert distinct effects on student achievement (Duncan, 1994). In the United States, several researchers found that the presence of affluent neighbors is a significant predictor of school leaving (Brooks-Gunn et al, 1993; Clark, 1992). In addition, Dornbusch and colleagues (1991) found that low neighborhood socioeconomic status has a negative effect on student grades, even after controlling for individual family background. Similarly, Binder (1999) explains that average community earnings are a significant predictor of desired schooling in Mexico.

Corman's (2003) study uses data from four waves of the National Household Education Survey to provide evidence that community wealth decreases the probability of grade repetition for U.S. students ages 6-15. Children in richer neighborhoods are less likely to repeat a grade than children living in poorer neighborhoods. In short, one of the most clearly established sources of community disadvantage is economic constraints present in the community.

International studies have documented that schools in many communities are constrained by local financing (Bray, 1996; Tsang, 1994). In many nations, communities are required to raise funds for schooling to supplement the inadequate funds provided by national governments (Bray, 1996). However, faced with a weak tax-base, many local governments in poor communities are unable to adequately finance their local schools (Bray, 1996). Accordingly, resource-constrained local schools must rely increasingly upon local sources of funds generated by community donations, revenue from school businesses, and student fees (Cheng, 1994; Ross, 1999; Hannum and Park, 2002). Often, poor communities are unable to pay teacher salaries, provide school supplies, or fund the costs of basic amenities such as heat and water (Tsang, 1994; Cheng, 1996). In many countries as the burden of raising school finances falls increasingly on local communities,, local economic resources are likely to become increasingly important determinants of local school quality.

In more recent investigations of community effects, primarily in the United States, scholars have extended their explorations of the role community resources play in shaping educational advantage and disadvantage beyond issues of local economics to consider the social contexts in which children learn. For example, Stanton-Salázar and Dornbusch's (1995) investigation of Mexican high school students in the San Francisco area revealed a positive correlation between social networks and academic achievement. Similarly, in their study of at-risk youth, Furstenberg and Hughes (1995) find that social capital, broadly defined, is positively associated with socioeconomic success in early adulthood. Coleman and Hoffer (1987) also credit differences in the social capital of the communities surrounding schools with the extant existing differences in student achievement that we observe between public and Catholic schools.

In explaining how the presence of social capital might influence student performance in school, Coleman (1988) contributed the concept of "intergenerational closure," or the relationship of an individual student's parents with their children's friends' parents. Coleman explains that when parents are in relationships with other parents, they are more likely to exchange information that may foster children's schooling. The following example illustrates how intergenerational closure may operate. Suppose two students develop a plan to avoid studying for a test: one student tells her mother she is studying at the other child's home and vice versa. Instead of studying, the two students are actually at a third child's home listening to a new CD. However, if the children's parents know each other and communicate regularly, the children's ruse will be uncovered quickly— perhaps even in time for their parents to get the children to study for the test. In this way, intergenerational closure helps parents garner the information needed to enforce norms and shape expectations about schooling.

The results from empirical examinations linking intergenerational closure with educational outcomes have been mixed. Consistent with the illustration provided, Sandefur and Lauman (1998) found that information about their children's efforts and successes at school can help parents influence their children to engage with school. Similarly, using the 1988 NELS data, Carbonaro (1998) found that intergenerational closure is positively associated with both student math achievement and school retention. However, a more recent investigation of the 1988 NELS data that treats social capital as a collective asset indicates that intergenerational closure in public schools is negatively associated with gains in mathematics achievement when controlling for friendship density (Morgan and Sørenson, 1999). These researchers argue that it is friendships between students rather than parents of students that positively influences learning.

Taken as a whole, the existing literature on community effects suggests that the differences in educational outcomes across communities may arise from various characteristics and processes operating at the community level. First, local economic resources influence enrollment, attainment, and achievement. The reviewed research emphasizes that it is not only the economic resources at home that matter, but also the average wealth of the surrounding families. Community economic resources may influence educational outcome by shaping the quality of local schooling. In addition, community wealth affects the quality of after-school activities available to community youth—activities that also affect aspirations, effort, and learning. Second, the extent and quality of community social relationships influence the ways communities shape expectations, share information, and enforce rules. In this way, communities with more social resources are more likely to influence student behavior and beliefs both in and out of the classroom.[1]

Educational Reform During Decentralization Era China

Nearly two decades of decentralization reforms have made China an informative case study for investigating the relationship between community resources and schooling. The shift of financial responsibilities from the central government to local levels was the foundation of the country's decentralization reforms in education (Cheng, 1996). Based on the *Decision on the Reform of the Educational Structure* in 1985, local governments were given the responsibility for raising and spending educational revenue. In practice, the state retained control of curriculum and teacher development, but withdrew its financial and administrative commitments. This decision was strengthened by several educational policies published in the 1990s, which reaffirmed the state's commitment to a more decentralized system with a more diversified resource base.[2] Typically, provincial governments are now responsible for the provision of higher education, county governments finance and manage secondary schools, and villages pay for and run primary schools.

As a result of these policies, local governments were required not only to raise their own funds for schools, but also to mobilize nongovernmental and community resources. First, schools were encouraged to set up school-run enterprises, such as orchards, bakeries, or bicycle repair shops. By 1993, school-run enterprises were generating 5.4% of the total national expenditure on education (Tsang, 1996). Next, schools were encouraged to solicit social contributions from local citizens and businesses. And finally, many schools made up the difference between their revenue and costs by charging a variety of school fees (Paine, 1998; Bray, 1996; Tsang, 1994). In this way, decentralization may be responsible for the increasingly local nature of Chinese schooling, now tied to local economies and social organizations.

Community Resources and Schooling in Rural China

Not surprisingly, scholars who study schooling in China have also discovered connections between economic resource constraints in the community and educational disadvantage (World Bank, 1992; Connelly and Zheng, 2003; Adams and Hannum, 2005). Connelly and Zheng (2003) demonstrate that school enrollment is directly linked to county per capita income. Furthermore, their results indicate that community circumstances affect enrollment even when family background is taken into account.

Adams' (2001) examination of children in the early 1990s reveals a positive relationship not only between village wealth and enrollment, but also between village wealth and children's rate of progress through school. Adams and Hannum's study (2005) illustrates that village infrastructure is also important in the provision of social services. Perhaps more telling, children who live in communities where village enterprises contribute financial resources to schools are always more likely to be enrolled in school. Although this research empirically links community resources and education in rural China, it is limited by both an emphasis on enrollment probabilities and a narrow definition of community conditions.

Few studies have sought to link local economic differences to children's experiences once they are in school. Policies that have emphasized both financial decentralization and the expansion of compulsory education taken together with data limitations have resulted in research focused on determining whether community effects only predict enrollment. In recent years, some researchers have widened the scope of their investigations by exploring the connections between community resources and a more complex outcome, grade-for-age student attainment (Adams, 2001; Adams and Hannum, 2005).

Another strand of research focuses on the connection between community differences and indicators of school quality, such as educational expenditure. For example, Park, Li, and Wang's study (2003) of school equity in rural China reveals that village income per capita is positively associated with both the percentage of qualified teachers in the village and the percentage of students with desks and chairs. Yet their research falls short of establishing how these differences across villages affect what children learn in school. A knowledge gap exists concerning the influence that communities exert on achievement once children are enrolled in village schools. A more detailed understanding of the ways in which local community resources affect student achievement is particularly needed now as school enrollment rates rise in China's poor interior and educational policy refocuses on issues of quality.

Even less well established are the particular facets of communities that influence children's experiences in school. Previous research in the Chinese context has linked general indicators of economic development, such as village per capita income or the presence of electricity to improved educational outcomes (Adams, 2001; Adams and Hannum, 2005). However, this work is limited by a narrow definition of community that captures only the most basic economic characteristics in a village and overlooks the social resources available for cultivating education. Two notable exceptions are the research of Connelly and Zheng (2003), who constructed a variable to represent community norms for education, and the qualitative investigations of Ross and Lin (2002), who reveal the importance of communities' ability to use social networks to bring together resources to support local schools.

On this foundation, individuals in some villages may benefit from the existence of community norms that support education. For example, in some communities pressure to enforce child labor laws could encourage children to stay in school and work hard rather than to drop out and seek employment. Connelly and Zheng (2003) found that positive community norms for education, as measured by the proportion of village children in school, positively affected educational outcomes for children in the village. Similarly, some villages have links to social organizations in other communities that they use to generate both financial and human resources for local schools (Ross and Lin, 2002). For instance, rural schools that have relationships with schools in more prosperous areas sometimes "borrow" qualified teachers for a term to improve the skills of local teachers (Lee and Li, 1994). In this way the strength of social networks—both within and outside some communities—may contribute to the sharing of information or behavior that furthers student achievement.

In summary, this study addresses some of the limitations of previous research and makes several new contributions to understanding the influence of community resources on schooling in rural China. First, this is the first study of rural China that links differences across communities with variation in student achievement, rather than enrollment or attainment. Second, by utilizing village and school-level data, I extend my analysis beyond basic indicators of village economic level to the actual differences in school revenue garnered within the village. Third, drawing on social capital theory and specifically Coleman's concept of intergenerational closure, I test empirically whether social relationships in the community matter for student achievement. Each of the above contributions is possible because of a rich data set collected during the summer of 2000 in rural Gansu Province, China.

DATA AND METHODOLOGICAL APPROACH

Data: Gansu Survey of Children and Families

To examine community influences on children's schooling outcomes in rural China, I use data from the Gansu Survey of Children and Families (GSCF-1), a multi-level survey of children aged 9-12 , which was conducted during the summer of 2000 in 100 villages in Gansu province. Gansu, located in China's northwest, embodies the geographic diversity and poor economic conditions that characterize China's interior provinces. Poverty rates are high and economic growth is slow (Gansu Statistics Yearbook, 2001). Although rural industries have slowly emerged, for the most part residents are employed in subsistence farming. The average annual per capita income of rural residents was only 63% of the national average in 2000 (Gansu Statistics Yearbook, 2001). The illiteracy rate, approximately 14%, is more than double the national average in China (Gansu Statistical Yearbook, 2001).

Most children in Gansu attend primary school in their village. Provincial educational statistics indicate that nearly 99% of school-aged children are enrolled in school (Gansu Educational Statistics Yearbook, 2000). However, this figure masks the numerous children who start school late and drop out early. Many children leave school because of health problems or financial constraints, only to enroll again another time. Poor families often lack the resources to pay school fees (Hannum and Park, 2002; Bray et al, 2004). In addition, persistent poverty negatively affects children's health and nutrition, and in turn, their ability to regularly attend and learn in school.[3] Moreover, in some communities, children leave school because of general attitudes towards schooling. For example, if enrollment rates in a particular community are generally low, families who do not choose to send their children to school are not considered unusual, and in turn, are not pressured by other village members to support schooling (Bray et al, 2004).

In this setting, schools also reflect poverty. While most rural villages have a local primary school, many rural villages lack the capacity to raise the funds required to adequately fund education. Funds collected locally, including student fees, pay for nearly all school expenses (Bray et al, 2004). Many teachers in Gansu have little training or access to professional support. Even more alarming, it is common for teacher wages to be three months late.

The GSCF-1 examines children's schooling, achievement, and welfare in the context of rural poverty by integrating a primary sample of 2000 children with secondary samples of children's mothers, homeroom teachers, school principals, and village leaders. In addition, a teacher questionnaire was administered to all teachers in schools attended by sample children;providing a sample of more than 1,000 primary school teachers. The random multi-stage cluster design was employed at each stage draws children from village lists of school-aged children in selected villages. Achievement tests in mathematics or Chinese language, designed by specialists at the Gansu Educational Commission, were administered to all children in the sample. On a random basis, half of the children were administered the mathematics examination; the remaining half were administered the Chinese language examination. Different exams were administered to children in grades 3 and below and to children in grades 4 and above to ensure that the tests assessed an appropriate range of knowledge.

Analytic Sample

This study used an analytic sample of 436 students in grades 1-3, all of whom were given the mathematics exam. All of the students also attended school in their own village.[4] This sample was chosen to address both methodological and substantive concerns. First, I limit the study to the children who were administered the mathematics exam.[5] Within this group of students, some of the students were administered the math exam for children in grades 1-3, and some were given the exam for grades 4 and above. Accordingly, I exclude the children in grades 4 and above. Next, in an attempt to find out more about whether community resources influence schooling at the local village school, I limited the sample in two additional ways. I excluded villages with more than one primary school.[6] I also restricted the sample to children who attended school in their own village.[7] Children who were enrolled at boarding schools or attended a school in another village were not included in the sample.

Measurement

This investigation focuses on a subset of questionnaire items that measure individual level and village level characteristics. The data was collected through questionnaires administered to the children, their mothers, the village leaders, and also through village primary school instruments.

TABLE 1 ABOUT HERE

Table 1 presents descriptive statistics for all variables included in the analyses. The student level data consists of controls for the children's socioeconomic background and other factors that are hypothesized to affect learning. The village level data includes variables detailing the economic and social resources in the village, as well as controls for village population and topography. Table 1 also contains data on student mathematics achievement.

This paper examines the effect of community on children's achievement in mathematics as measured by a test developed by the Gansu Educational Commission. The test, which was scored on a scale of 0-100, was developed to examine an appropriate range of the primary school curriculum for students in first, second, and third grades. The mathematics exam scores in the analytic sample range from 0-99, with an average score of 42.44. As expected, the average score for second grade students of 29.91 is higher than the average score for first grade students of 15.54. Similarly, the mean score for third graders of 59.64 was higher than scores for students in grades one and two.

Child background measures included as controls include a categorical representative of students' grades in school and the children's ages, which range from 7-13. Because previous research findings reveal that girls may experience more constraints to schooling in rural China (Hannum, 1998; Zhang, 1998), I also include student gender (coded 0 if female and 1 if male) as a control predictor. As indicated in Table 1, 49% of the analytic sample, or 214 students, are female. Family wealth is also included as a control predictor because of previous research that connects financial resources in the home to schooling in rural China (Brown and Park, 2003; Adams, 2001). The sample average value for the log of family wealth is 8.95 with a standard deviation of 0.94.

In addition, I include two predictors to control for children's opportunity to learn. The first is the variable, absent, that captures the number of days a child has missed school during the previous semester. The average number of days absent in the sample is less than one, indicating that many students do not miss much schooling at all. However, as suggested by a standard deviation that is more than three times as large as the mean, there is large variation in days absent across children. For the students who have missed school during the semester, the number of days absent ranges from 1 to 8. These absences may limit children's opportunity to learn, and in turn, influence their achievement. I also control for the number of books that the family purchased that semester, as an indicator of support for education in the home. Books in the home can be regarded as a form of cultural capital in the family. Hannum and Park (2001) found that the presence of books in the home supports the child's educational aspirations and academic confidence.

Table 1 also contains descriptive statistics on the village-level variables selected to control for the effect of community when estimating differences in student achievement in mathematics. In this study I control for both village population and village topography. Finally, the majority of village primary schools do not receive financing from the government; rather they rely completely on financial resources collected at the village level. In my analytic sample, 32 schools (less than half) received some funding from the government.[8] I control for the presence of these funds by including the log of per pupil expenditure from government funds as a predictor in my analyses. This variable varies widely, ranging from 1-125 yuan.

Most importantly, Table 1 also presents descriptive statistics on two carefully selected village-level question predictor variables—economic resources and social resources. Based on research findings that suggest the increasing importance of community economic resources for local schools (Adams, 2001; Adams and Hannum, 2005; Park et al, 2003; Tsang, 2003), I use the log of per pupil expenditure from nongovernmental or extrabudgetary resources to represent community economic resources.[9] For example, Park, Li, and Wang's research (2003) indicates that extrabudgetary financing increased during the mid- and late-1990s.

To capture the effect of social resources in the community, I draw on the work of James Coleman (1988, 1991) in creating a variable to represent "community closure." Coleman identified the concept of "intergenerational closure," which can be defined as the relationship of an individual student's parents with the parents of their children's friends. In the Gansu Survey of Children and Families, mothers were asked if they knew the parents of their children's friends. I use the average response of mothers in the village to this question to capture "the community closure" in the village. This variable ranges from 0 to 1, with villages that score closer to 0 having less social capital and villages with scores closer to 1 having more social capital. As displayed in Table 1, the average score is 0.73. In communities with more social capital, more parents know the parents of their children's' friends, and as a result can garner information about school related matters, shape and share behavioral norms, and monitor child behavior.

Analytic Strategy

The following analysis presents figures accompanied by regression analyses of student math achievement. In the first set of fitted regression models presented in this paper, I use a fixed effects analysis to examine whether there is an overall relationship between student mathematics achievement and the village in which the student lives, net of family poverty and other individual characteristics. After controlling for selected child and family characteristics, I ask whether children who live in some villages in Gansu have higher mathematics achievement than children who live in other villages, on average. To conduct this fixed effects analysis, I regress the student mathematics outcome on a system of 85 dummy variables, V_1 thorough V_{85}, representing the 85 different villages in the analytic sample, controlling for individual-level variables. In this model, each group of children who live in the same village shares a unique intercept parameter or "village fixed effect." An examination of the heterogeneity among these distinct intercepts indicates whether villages differ in students' mathematics achievement, on average, controlling for child background. The hypothesized fixed-effects model is as follows:

$$MATH_{ij} = \beta_1 V_1 + \ldots \beta_{85} V_{85} + \delta Z + \varepsilon_{ij}$$

for the i^{th} student in the j^{th} village. Regression parameters β_1 through β_{85} represent the main effects of the village fixed effects, and the δ coefficient represents the effect of the vector of control variable, Z, and ε is the usual regression residual. I fit this model to my data using OLS multiple regression analysis to estimate and test model parameters. I begin by estimating the model containing only the student-level control predictors. Next, I estimate a model containing the system of village dummies. I compare models on the overall goodness of fit, using the R-squared statistic. Additionally, I use a general linear hypothesis test to test a joint null hypothesis that the regression parameters, β_1 through β_{85}, the village fixed-effects, were simultaneously equal. Rejecting this joint null hypothesis will indicate that the community where a child lives does affect math achievement, and consequently sets the stage for a second phase of the analysis in which I investigate what kind of community characteristics affect the village effects.

In the second set of hypothesized regression models, I explore the effect of community economic and social resources on student mathematics achievement by replacing the fixed effects of village by their equivalent random effects, and including selected predictors that describe the presence of community level resources in a new taxonomy of fitted regression models. In these analyses I ask, on average, do children who live in villages with higher levels of economic and social resources have higher math achievement, controlling for child background? I fit these models using GLS regression analysis in order to account for the random effects of village now residing in the residuals. I use GLS regression and a multi-level model because standard OLS regression analysis does not account naturally for the nesting of the students within village. An examination of the estimated coefficients associated with each of the community-level main effects then indicates whether the selected community resources influence mathematics achievement in Gansu, net of child background. An example of a typical random effects model is:

$$\begin{aligned} MATH_{ij} &= \gamma_{00} + \gamma_{01} VILPOP_j + \gamma_{02} VILTOP_j + \gamma_{03} LGOVPPE_j + \gamma_{04} LNGOVPPE_j + \gamma_{05} CLOSURE_j \\ &+ \gamma_{10} LWEALTH_{ij} + \gamma_{20} AGE_{ij} + \gamma_{30} AGESQ_{ij} + \gamma_{40} GENDER_{ij} + \gamma_{50} GRADE2_{ij} + \gamma_{60} GRADE3_{ij} \\ &+ \gamma_{70} ABSENT_{ij} + \gamma_{80} BOOKS_{ij} + u_j + \varepsilon_{ij} \end{aligned}$$

where MATH is the math achievement score for the i^{th} child in the j^{th} village. γ_{00} represents the estimated average math score in the population providing all variables are centered on their grand mean, γ_{01}, γ_{02}, γ_{03}….are regression parameters representing the main effects of community level predictors on student achievement, and γ_{10}, γ_{20}, γ_{30}…are the regression parameters associated with individual level control variables. Residual ε is the unique error term associated with student *i* in village *j* and u is a random effect, representing the common unobserved characteristics that distinguish village *j*.

I begin by fitting the model containing the student-level controls. Next, I fit several models that include predictor variables that represent community economic and social resources. Models are compared on overall goodness of fit, using the R-squared statistic. A statistically significant and positive coefficient associated with any of the community-level variables (γ_{01}, γ_{02}, $\gamma_{03...}$) demonstrates that children who live in villages with higher levels of that particular community characteristic are associated with higher mathematics scores, on average, taking into account the other community and individual characteristics in the model.

Then I fit a final model to examine the interaction between village economic resources and village social resources. A statistically significant coefficient on the interaction term reveals that the effect of social resources on student mathematics achievement differs according to the economic resources present in the village. For example, the effect of social capital may be more pronounced in villages with less economic resources. Alternatively, the coefficient on the interaction term may not be significant, indicating that the effect of social and economic resources may be additive.

RESEARCH FINDINGS

The average mathematics exam scores in the analytic sample is 42.44. The scores vary widely, as suggested by the range from 0-99 and a standard deviation of nearly 28. Figure 1 provides a schematic plot illustrating variation in average unadjusted village mathematics scores by grade. Not surprisingly, the figure suggests that average math scores vary widely across villages even when we take grade into account. For example, average village mathematic scores range across 83 points for first and second graders, and 86 points for third graders. An examination of the interquartile ranges for students in grades one, two, and three also illustrates the extent of the variation in average mathematics scores across villages. For first graders, the middle 50% of average village mathematics scores also spread widely, falling between 26 points of each other, from approximately 3 to 29 points. Among second and third grade students, the interquartile range is not as large, or approximately 23 points, as among first graders, yet it continues to demonstrate ample variation in average village mathematics scores.

FIGURE 1 ABOUT HERE

In order to determine whether there is an overall relationship between student mathematics achievement and the village in which the student lives, we now turn to regression analysis, and examine the fixed effects of villages on student mathematics achievement.

Examining mathematics achievement across rural villages in Gansu: Does it matter where a child lives?

Table 2 displays the parameter estimates for a selection of fitted models predicting the influence of where a child lives on student mathematics achievement, controlling for child socioeconomic background, days absent from school, and the number of books purchased that semester.

TABLE 2 ABOUT HERE

Model 1 controls only for the individual characteristics of the student. This fitted model suggests that the only statistically significant student level predictor of math achievement included in the fitted model represents the student's grade in school. In addition, in this model, only 40% of the variation in mathematics achievement is predicted by the student level characteristics, leaving a substantial portion of the variation unexplained.

Model 2 presents the results of a fixed effects regression analysis in which student mathematics achievement is predicted by a system of dummy variables representing villages, controlling for student background and other individual characteristics. Most of the student-level control predictors that represent student socioeconomic background continue to show the same relationship as in fitted Model 1. In addition, however, the results in Model 2 suggest that student mathematics achievement depends on both school attendance and books purchased in the last semester. All else being equal, each day a student was absent in the last semester is associated with a decline of 2.1 points in the mathematics test score, on average. Like students who usually attend school, children who have purchased more books in the last semester are likely to have higher mathematics achievement. Perhaps most importantly, all else being equal, the village in which a child lives influences his or her mathematics score.

But what is the magnitude of the differences in average mathematics achievement across villages? After controlling for the effect of student background, I found that the estimated variance of the estimated village fixed effects is 239.5. However, to provide a more reliable estimate of the magnitude of these differences, I need to take into account measurement error in the village-specific fixed effects displayed in Table 2.1.[10] After for controlling for student background and adjusting for measurement error, I found that the estimated variance of the true village effects is 153.1. Thus, one standard deviation difference in the true village effects is associated with an estimated difference in student mathematics achievement of approximately 12 points. These results support my hypothesis that where a child lives matters, and suggest that differences in village level characteristics influence student mathematics achievement. In the next section, I investigate whether economic and social resources in the village affect individual student achievement.

Do children who live in communities with higher levels of economic and social resources achieve higher mathematics scores?

In the fitted models presented in Table 3, I replaced the village fixed effects present in the previous taxonomy of models with their equivalent random effects, and added selected predictors to represent village characteristics to the regression models. I continued to control for the individual characteristics of the child and also take into account the village population, village topography, and per pupil expenditure from government funds.

TABLE 3 ABOUT HERE

In Model 3, I include the log of per pupil expenditure from nongovernmental or extrabudgetary resources to represent community economic resources. The coefficient on this variable indicates that students who live in villages that have higher per pupil expenditures from extrabudgetary, or locally-generated, resources have higher mathematics scores on average, controlling for student characteristics and other village characteristics with the exception of village social capital. The coefficient on the log of per pupil expenditure from nongovernmental funds in Model 5, which controls for village social capital, is only slightly different from the coefficient in Model 3, indicating that this measure of village economic resources exerts a distinct influence on student achievement, and operates separately from the effect of the measure of village social resources.

Models 4 and 5 display the effect of village social capital as measured by "community closure." The coefficient on this variable in Model 4 indicates that on average, children who live in villages with higher levels of social capital, or where more mothers know the parents of her child's friends, children have higher mathematics scores, controlling for individual and village characteristics. The coefficient on community closure in Model 5, which also controls for a measure of village economic resources—namely the log of per pupil expenditure from nongovernmental funds—is nearly identical to the coefficient on this variable in Model 4, indicating that the effect of village social capital remains the same even when accounting for village economic resources.

The fitted models presented in Table 3 lead to two important findings. First, on average, children who live in communities that have a higher per pupil expenditure from nongovernmental resources have higher mathematics achievement, net of controls. Similarly, children who live in villages with a higher level of community closure, i.e., where more parents know the parents of their children's friends, have higher mathematics scores on average. These findings support the hypothesis that differences in economic and social resources at the community level partially explain the difference across villages in mathematics achievement.

The specific effects of village economic and social resources can be better appreciated in Figure 2, which illustrates fitted math achievement as a function of per pupil expenditure from nongovernmental resources and community closure. In this plot, child background and other village level characteristics remain constant. The figure shows the estimated mathematics achievement for a female student, age 10, in grade 3, who has not been absent from school in the last semester, and who purchased the mean number of books during this period. She lives in a small village in the mountains or plains and her school, like many village primary schools, does not receive funding from the state. Village social capital, as measured by community closure, is displayed on the horizontal axis with a scale of 0 to 1; villages that are closer to 1 have more social capital. The four sloping lines represent prototypical students in villages at the quartiles for per pupil expenditure from nongovernmental resources.

FIGURE 2 ABOUT HERE

Figure 2 shows that there is a positive relationship between village social capital and math achievement when per pupil expenditure is held constant. All else being equal, the data shows that villages with more social capital have higher mathematics scores. For example, in a village with low per pupil expenditure from nongovernmental resources and low village social capital (0.3), a child could have an estimated math score of 42 points. If the same child lived in a village with average social capital (0.73), her score would be six points higher, and if she lived in a village with high levels of social capital it would be even higher.

The prototypical fitted plot in Figure 2 also displays the effect of village economic resources. When we hold village social capital constant, the gaps between the sloping lines represent the effect of per pupil expenditure. For example, in a village where social capital is average (0.73), a child might have an estimated mathematics score of 48 points, net of other controls, if she lived in a village with low per pupil expenditure from nongovernmental resources. If the same child lived in the same type of village, but one with high (top quartile) per pupil expenditure, her estimated mathematics score would be 59 points, or a difference of 11 points between the poorest and wealthiest villages.

The effect of village resources is even more striking if we compare the differences in estimated mathematics achievement between a child who lives in a village with the highest levels of social and economic resources with a comparable child who lives in a village with the lowest levels of social and economic resources. The gap in estimated mathematics achievement is 21 points.

Does the effect of village social capital differ depending on the economic resources available in the community?

The final question posed in this paper examines whether the effect of village social capital operates differently on student mathematics achievement depending on the village economic resources. Model 6 in Table 3 sheds light on this hypothesis by interacting community closure with the per pupil expenditure from nongovernmental (i.e., community generated) funds. As displayed in Model 6, the coefficient associated with the interaction term is not significant, suggesting that the effect of village social capital, as measured by community closure, was not conditioned by the economic resources in the village. In other words, village social capital exerted the same effect on student mathematics achievement regardless of whether the student lived in a village with more or less economic resources.

DISCUSSION AND CONCLUSION

Community Matters: Where a Child Lives and the Resources Present in the Village Influence Student Achievement

The results presented in this paper reveal important new insights regarding the relationship between communities and schooling in rural China. One of the most striking findings is that where a child lives definitely affects student achievement. There are large differences across villages in average mathematics achievement. In addition, these analyses reveal that the differences in educational outcomes across communities arise, at least in part, from specific characteristics and processes operating at the village level. In other words, economic and social resources in the village influence student achievement.

More specifically, children who live in villages with higher per pupil expenditures from nongovernmental resources have higher mathematics scores, on average, even when taking individual background and other village characteristics into account. In this way, the economic resources available to spend on schooling in a particular village may influence educational outcomes by shaping school quality. This finding resonates with the concerns expressed by children and parents in rural Gansu during interviews. One child said that the problem with his school is that it didn't have any money. He went on to explain, "Our village doesn't have any money, so there's no money to go to the school." Villages with more economic resources may have a higher percentage of qualified teachers working at the village school and a higher percentage of students with adequate materials for learning. In addition, community economic resources may also affect the quality of after-school activities available for children in the community and may, in turn, indirectly shape student aspirations, effort, and attitudes about schooling.

An additional avenue of community influence is social relationships. These results indicate that net of child background and other village characteristics, children who were living in communities where a greater number of parents knew the parents of their children's friends had higher math scores, on average. It is important to note that it is probably not the actual friendships between parents that affect student achievement. Rather, children who live in this kind of community may be advantaged by the support, guidance, and common values created by these relationships among parents.

This finding also echoes the explanations provided by Gansu parents during interviews. When parents described their conversations with other parents, they talked about collaborating on common rules for their children, such as having the children finish all of their homework before they can play. In addition, they talked about how they should reprimand village children who didn't follow these guidelines. One mother recounted the story of a time when one of her daughter's friends was not studying well or paying attention in class. The woman called the young girl to her house and told the child "to focus on studying and not to play too much…..or she would not test into junior high." In this way, social pressure from parents helps to promote behavior that may improve student achievement in some villages. Interestingly, this study's results indicate that in the case of rural China, the effect of village social and economic resources are additive rather than interactive. Village social capital effects did not vary according to the economic resources present in the village.

As in many other parts of the world, community matters for children's schooling in rural China. This paper demonstrates that village differences in the economic and social resources available to support local schools have consequences for the students who live in these communities and attend village schools. The decentralization of school funding and management has served to create schools that are increasingly local institutions, reflecting the economic and social resources of the communities they are a part of. As schools become more local, they also become more diverse, reflecting different levels of economic resources to draw on, different kinds of physical infrastructure to facilitate schooling, and different social resources to mobilize. Cross-community inequality is linked to the quality of village schools, and ultimately student achievement.

NOTES

[1] Despite the findings described above, the conclusion that communities "matter" is not reached without difficulty. One frequently argued problem when discussing community effects in the United States is that people are not randomly assigned to their neighborhood. Instead, similar types of people tend to choose or

self-select into the same communities—the Tiebout process. However, this process of choice is not relevant in rural China where geographic mobility is extremely restricted.

[2] Please see Central Committee of the Community Party, 1993 Education Law (Jiao yu fa) Beijing, (1993); and Central Committee of the Community Party, 1995 Education Law (Jiao yu fa) Beijing, (1995).

[3] For example, many children in Gansu consume low levels of nutrients which affect cognitive development, such as Vitamin A, iron, and zinc. See Emily Hannum and Albert Park, "Educating China's Rural Children in the 21st Century."

[4] This sample size provides me with sufficient statistical power (>.80) to detect small effects at the usual levels of Type I error (Light, et al, 1991).

[5] Previous research indicates that mathematics is more sensitive to differences in school characteristics than language achievement. See Richard J. Murnane, "The Impact of School Resources on Inner City Children."

[6] For example, some communities have an incomplete primary school, serving children in grades 1-4, and a complete primary school, enrolling students in grades 1-6. Due to data limitations, I cannot determine how the village allocates financial resources between these schools. Eight villages were dropped from the sample because they had more than one village primary school. As a result, 47 children were excluded from the analytic sample.

[7] China has a system of residency laws that require most children to attend schools in their official residences. However, most children walk to school, and so may attend school in a neighboring village if it is closer to their home. Similarly, some children attend boarding schools if their homes are so remote that they are unable to commute to school daily. Due to these circumstances, I excluded 16 children from the analysis.

[8] The variable representing the funds received by village schools from the state (GOV) was missing for 31% of villages. I regressed 15 variables from the village and village school surveys on GOV. These variables are described in Table A6 in Appendix (6). The R^2 statistic from the regression was .97, indicating that the variables included in the regression explain 97% of the variation in GOV. Given the high R^2 statistic, I decided that using the imputed values would result in estimates that were less biased than either excluding the cases with missing data or using the mean value of GOV to replace the missing values.

[9] The variable representing the funds received by village schools from the villages, social organization, school's own revenue, and donations from students, teachers, and officials (NONGOV) was missing for 45.2% of villages. I regressed 27 variables from the village and village school surveys on NONGOV. These variables are described in Table A7 in Appendix (7). The R^2 statistic from the regression was .88, indicating that the variables included in the regression explain 88% of the variation in NONGOV. Given the high R^2 statistic, I decided that using the imputed values would result in estimates that were less biased than either excluding the cases with missing data or using the mean value of NONGOV to replace the missing values.

[10] In order to adjust for measurement error and estimate the variance of the true village effects, I fit a random-effects model, and found that the estimated variance of the true village effects is 153.1. I used a Breusch-Pagan Lagrangian Multiplier Test to test the null hypothesis that the variance of the true fixed-effects is zero. The estimated variance of the village fixed-effects is 239.5, which is considerably higher than the estimated true variance obtained from the random-effects model. Thus, the estimated reliability of the measurement of the village fixed-effects is 0.64.

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TABLE 1. Descriptive Statistics for 436 1st, 2nd, and 3rd Graders in 85 villages in Gansu Province, China

Data Source: GSCF-1, 2000

Variable	Mean	Standard Deviation	N
OUTCOME VARIABLE			
MATH (Grades 1-3)	42.99	(27.92)	436
STUDENT-LEVEL CONTROL VARIABLES			
GRADE 1	0.14	(0.34)	436
GRADE 2	0.38	(0.49)	436
GRADE 3	0.48	(0.50)	436
AGE	10.04	(0.95)	436
AGE-SQUARED	101.77	(19.48)	436
GENDER (FEMALE=0, MALE=1)	0.51	(0.50)	436
LOG FAMILY WEALTH	8.946	(0.901)	436
DAYS ABSENT	0.32	(1.04)	436
BOOKS	17.82	(14.95)	436
VILLAGE-LEVEL CONTROL VARIABLES			
VILLAGE POPULATION	1574.62	(796.13)	85
TOPOGRAPHY (HILLY=1)	0.20	(0.40)	85
LOG GOVT PER PUPIL EXP.	1.082	(1.507)	85
VILLAGE-LEVEL PREDICTOR VARIABLES			
LOG NON-GOVT PER PUPIL EXP	1.521	(1.521)	85
VILLAGE SOCIAL CAPITAL (0-1)	0.73	(0.20)	85

FIGURE 1. Variation in Village Mathematic Achievement, Represented by Village-Specific Intercepts, (nvillage=85, nstudents =436).

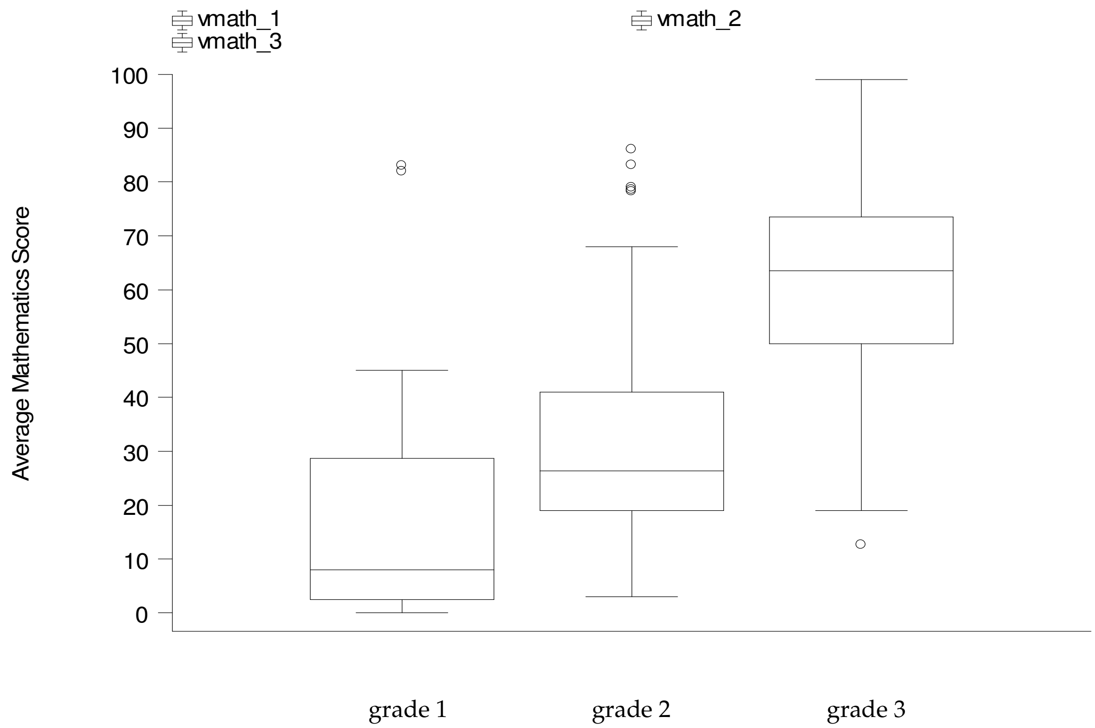


TABLE 2. Regression of Student Mathematics Achievement on Socioeconomic Controls and Village Fixed Effects (n students=436; n villages=85)

Data Source: GSCF-1, 2000

	Model 1		Model 2	
STUDENT-LEVEL SOCIOECONOMIC CONTROL PREDICTORS				
GRADE 2	14.381***		17.187***	
GRADE 3	44.988***		48.716***	
AGE	-20.910		0.848	
AGE-SQUARED	0.999		-0.048	
GENDER	-0.680		-0.013	
LOG FAMILY WEALTH	1.884		1.537	
DAYS ABS	-0.569		-2.159*	
BOOKS	0.061		0.158*	
VILLAGE FIXED EFFECTS				
VILLAGE 1			32.624**	
VILLAGE 2			36.283***	
VILLAGE 3			33.086**	
VILLAGE 4			37.997***	
VILLAGE 5			13.127	
VILLAGE 6			13.544	
VILLAGE 7			11.359	
VILLAGE 8			51.378***	
…………………………….				
VILLAGE 78			18.395	
VILLAGE 79			25.007	
VILLAGE 80			25.110*	
VILLAGE 81			54.984***	
VILLAGE 82			46.383***	
VILLAGE 83			53.133***	
VILLAGE 84			55.739***	
Goodness of Fit			R^2 within	0.545
			R^2 between	0.249
	R^2	0.416	R^2 overall	0.409
			Test of equality of VILLAGE coefficients	$F_{84,343}$=4.12***

~<.10, *p<.05, **p<.01 ***p<.001

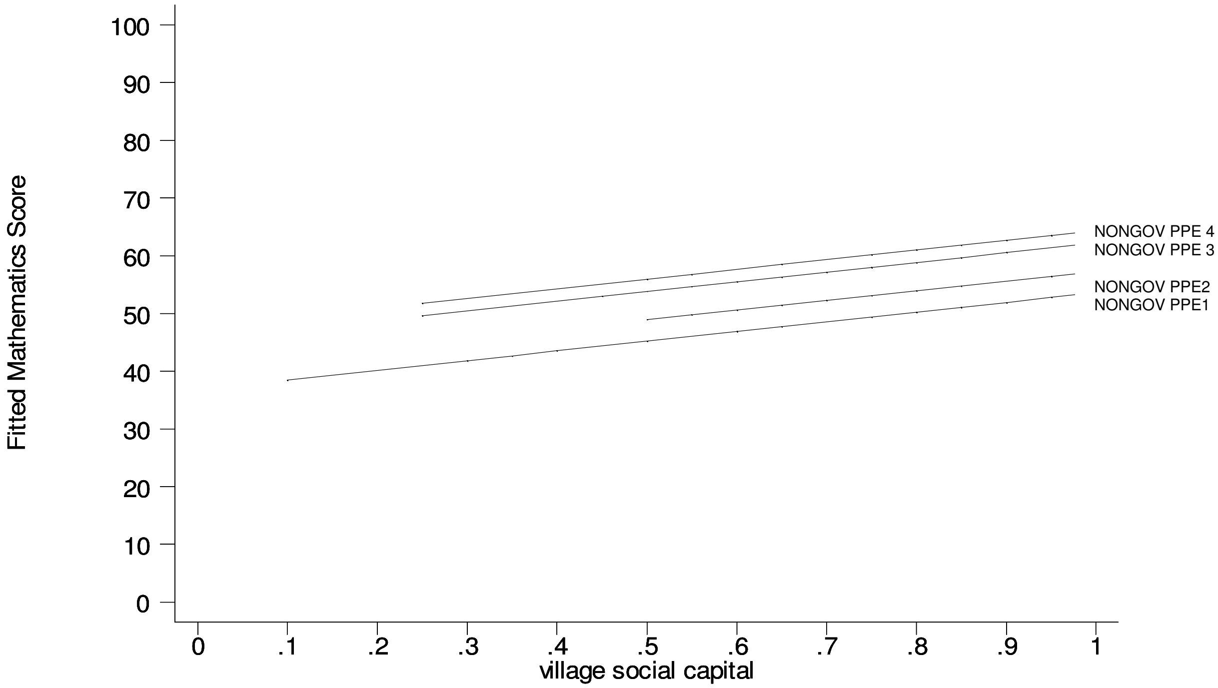
TABLE 3. Regression of Student Mathematics Achievement on Socioeconomic Controls, Village Controls, and Village Predictors (n students=436; n villages=85)

Data Source: GSCF-1, 2000

		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
STUDENT-LEVEL SOCIOECONOMIC CONTROL VARIABLES							
GRADE 2		16.645***	16.068***	15.713***	15.745***	15.347***	15.419***
GRADE 3		47.657***	47.460***	47.105**	46.856***	46.431***	46.546***
AGE		-8.412	-6.899	-5.615	-6.374	-4.986	-4.973
AGE-SQUARED		0.389	0.310	0.240	0.296	0.222	0.220
GENDER		0.020	-0.020	0.043	0.008	0.074	0.051
LOG FAMILY WEALTH		1.578	1.568	1.323	1.520	1.264	1.278
DAYS ABS		-1.632~	-1.558~	-1.498~	-1.652~	-1.601~	-1.630~
BOOKS		0.125~	0.126~	0.112~	0.122	0.108	0.110~
VILLAGE-LEVEL CONTROL VARIABLES							
L VIL POP			4.167	4.965~	5.018	5.827*	5.825*
VIL TOP			12.050**	14.339***	12.301***	14.481***	14.776***
LGOVPPE				0.996	-0.025	1.305	1.320
VILLAGE-LEVEL PREDICTOR VARIABLES							
LNGOVPPE				2.960**		2.895**	4.736
COMMUNITY CLOSURE					16.059*	16.147*	19.447*
INTERACTION							
LNGOVPPE*CLOSURE							-2.366
Goodness of Fit	R^2 within	0.544	0.544	0.544	0.544	0.544	0.544
	R^2 between	0.256	0.326	0.374	0.367	0.415	0.416
	R^2 overall	0.412	0.444	0.467	0.459	0.481	0.481

~<.10, *p<.05, **p<.01 ***p<.001

FIGURE 2 . Fitted Mathematics Achievement as a function of Village School Per Pupil Expenditure Funded by Nongovernmental Resources and Village Social Capital for a Prototypical Female Student, age 10, and is in Grade 3*
(n students=436, n villages=85)



** The student has not been absent from school in the last semester, and purchased the mean number of books during this period. She lives in a small village in the mountains or plains and her school, like many village primary schools, does not receive funding from the state.*