It Takes a Village?
Intergenerational Conflict and Cooperation in Education Expenditures

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Abstract

This paper explores the effects of elderly migration on the public provision of education. Previous research offers mixed evidence about the effect of the elderly on education spending, but consistently shows that racial differences between the older and younger cohorts have a strong negative effect on education spending. Extending Becker's work on the economic structure of the family suggests that the elderly will prefer higher education spending if they feel a sense of connection to their communities, and particularly to the youth in those communities. As a result, the elderly who have not recently migrated or who have migrated only a short distance are more likely to support education.

I use five-year migration data from the U.S. Census to explore this idea. My model controls for the possible endogeneity of elderly migration with respect to education spending. I find that education expenditures are higher when a larger fraction of the elderly has lived in the same county for at least five years, but are lower when the elderly who do migrate are from farther away. I also find cross-cohort racial heterogeneity to have no significant effect on education spending.

Introduction

A major theme in the public economics literature involves the determinants of spending on public education. Researchers including Poterba (1997, 1998), Ladd and Murray (2001), and Harris, Evans and Schwab (2001) have examined the effects of intergenerational conflict, and have found that the elderly have either a negative effect or no effect on education spending. A consistent finding in these analyses is that differences in the races of the elderly and the younger cohort are associated with significantly lower education spending. This paper provides evidence as to why support of education by the elderly varies. My results offer a new way of thinking about altruism, and help to explain the disturbing results others have found that might suggest racism among the elderly. If the elderly develop connections to their communities, the migration patterns of the elderly in an area should affect education spending in the area. My model includes instruments to explicitly explain the migration behavior of the elderly.

In a state-level analysis, Poterba (1997) finds that education spending falls as the state's fraction of elderly rises. This negative result is not robust to the addition of an urbanicity measure, however. Poterba also finds a strong negative effect of racial heterogeneity between the school-aged and elderly cohorts.

The relevant Tiebout market for education is generally accepted to be the county or metropolitan statistical area (MSA). Ladd and Murray (1999) point out that a county- or district-level analysis can capture many important features of education finance that would be missed at the state level. They conduct an analysis similar to Poterba's, but at the county level with county and time fixed effects. They find that the proportion of elderly has no significant effect on per child education spending in any specification.

However, they too find cross-cohort racial heterogeneity to have a negative effect. Ladd and Murray also perform a state-level analysis that includes measures for how retirees and children are distributed within states and how segregated the cohorts are. Their results indicate that segregation from the school-aged cohort makes the elderly less willing to support education.

The consistent negative effect of the "racial mismatch" leads to an interesting question. Are the elderly simply racist? I propose a different explanation. The negative effects of cross-cohort racial heterogeneity, combined with Ladd and Murray's segregation result, suggest that some sense of connectedness might matter to the elderly when they make decisions about funding for education.

The elderly do not enjoy the direct benefits of public education, unlike families with children. Other researchers including Poterba (1999) and Kemnitz (2000) have discussed the external benefits of education that might make the elderly more willing to improve it. These include decreased crime, a higher level of services such as health care, and increased Social Security contributions from the better educated younger cohort. In the real world, though, the elderly will not live to enjoy these external benefits of paying to improve education now. For example, improving a child's education now may make him less likely to commit crimes now, but the effect presumably (and hopefully) extends to the child's full lifetime. If this is the case, the elderly will not live long enough to benefit from the cumulative reduction in crime. The immediate gains to the welfare of the elderly will be small; thus, the elderly should be unwilling to fund education.

Altruism would mitigate this tendency. Following Becker's work on the economics of the family, grandparents are very likely to support those children who mean the most to them: their grandchildren. However, the number of grandparents living in the same locale as their grandchildren will in many cases be too low to affect the level of public education they receive. Once we are outside the confines of the family, the literature does not explain why we might be more altruistic toward some people than others.

I propose that the extent to which we are altruistic depends on how connected we are to the beneficiaries of our good will. Charity begins at home, and then extends to others. That is, if the elderly subscribe to the idea that "it takes a village to raise a child," they will also act to help other children who are part of their village --- close to them in a geographic sense or with whom they identify in some other way.

It may also take time for people to identify with their communities; if this is the case, they will become more altruistic with longer residence. If recent residents of a community maintain some sense of connection to their previous residence, support for education among the elderly should be highest where more of the elderly are long-time residents (i.e. moved a distance of zero), and lowest where more of the elderly have moved in from far away.

Empirical Strategy and Data Collection

In this paper I explore the effect of elderly migration on education expenditures. My first approach is to employ an ordinary least-squares model with state dummy variables. The dependent variable in my county-level model is the natural logarithm of per pupil state plus local revenues to education in county i in state j[1]. The basic model is

$$\ln(\text{per pupil revenues}_{ij}) = X_{ij}\beta + Z_{ij}\gamma + S_j\delta + \varepsilon_{ij}$$

where the explanatory variables of primary interest are those in Z_{ij}. Z is a vector of migration data consisting of the fraction of each county's population that is aged 65 and higher and that lived in the same county in 1990 as in 1985; the fraction that migrated to the county from within the same state; and the fraction that migrated from a different state.

Migration statistics from the United States Census of Population are available only at the county and state levels, precluding a district-level analysis employing these data. This information comes from respondents' answers to questions about where they lived five years earlier. Migration data including previous residence are available at the county level for 1990 only, making a panel analysis impossible. I therefore perform a county-level cross section analysis for 1990, using demographic and migration data from the 1990 Decennial Census of Population and Housing and school finance data from the 1992 Census of Governments.

[1] Poterba (1997, 1998) and Ladd and Murray (2001) use per child measures to help prevent any endogeneity issues with the number of public school pupils. However, Harris, Evans and Schwab (2001) use per pupil measures. The education revenues or expenditures and number of school-aged children are

X is a vector of demographic control variables. These include the number of school districts per hundred thousand population, fraction of the population that is nonwhite, median household income, fraction of those aged 25 and older with at least some college, fraction of homes owner occupied, and fraction of the population in an urban area. X also includes a term for cross-cohort racial heterogeneity, which is equal to the absolute value of the nonwhite share of the population aged 5 to 17 less the nonwhite share of the population aged 65 and higher,[2,3] per pupil federal aid to education, and a measure of the tax price of increasing education spending.

The tax price variable is equal to median household income divided by mean household income, multiplied by the mean number of children per household. If taxes for education are proportional to income, this is the median voter's cost of increasing per child education spending by one dollar[4]. As median income increases relative to mean income --- that is, as the income distribution becomes less skewed --- the median voter's education subsidy from wealthier families shrinks.

The education finance data include revenue to education from local, state and federal sources and the number of pupils enrolled in the fall semester, to yield per pupil state plus local education revenues, the coefficient of variation of per pupil revenues, and federal aid per pupil. These data are aggregated from the school district level to the county level. 98 districts were dropped because they could not be matched to a county.

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from two different data sources. I follow HES and construct the education finance variables from a single data source to avoid measurement error.

[2] 0.0000001was added to the fractional values in each county to prevent undefined values in the natural logarithm, and the resultant decrease in sample size.

[3] The linear distance between the nonwhite fractions of each cohort measures cross-cohort racial heterogeneity. Previous researchers use a simple difference, but the linear distance is the absolute value.

[4] See Lovell (1978) for a thoughtful discussion of this tax price variable and empirical evidence of its validity.

These include special districts for regional technical schools and other schools that appear to draw students from more than one county. 817 districts were dropped because their total revenue or enrollment was recorded as zero; 19 additional observations were dropped because of missing or obviously incorrect data. Districts in the independent cities of Virginia were not included in my county-level analysis, and some of the demographic data are not available for Hawaii or Alaska counties or the District of Columbia.

Some states mandate equalization of educational resources across districts within the state. In these states, there is little or no choice in education spending at the local level, so that expenditures on public education will not be affected by differences in demand due to differences in the characteristics of the residents. The ten states with legislation mandating equity in education spending or minimum adequacy standards are thus omitted from the sample.[5] The final aggregated sample consists of 2,348 counties from the remaining 38 continental states.

S_j is the vector of state dummies. These serve as controls for characteristics, such as state law and the structure of public education, that affect the state's education spending. State contributions make up a large fraction of a school district's revenues for education. Finally, the error term ε_{ij} is assumed to have zero mean and constant variance.

Differences in costs between rural and urban areas (e.g. teacher wages, transportation costs and economies of scale) also affect expenditures; therefore, I separately consider the urban portion of the sample. This subsample consists of the 1,750 counties from the

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[5] California, Connecticut, Wyoming, Arkansas, Montana and Texas had state Supreme Court decisions overturning the education finance systems and mandating equity in educational resources by 1990. The education finance systems of Washington and West Virginia were overturned for adequacy reasons.

full sample for which less than 100 percent of the population lived in a rural area. Table 1 shows the key summary statistics for the two county-level samples.

(Insert Table 1)

The characteristics of the full and urban samples are strikingly similar. The dependent variable is per pupil state plus local revenues to education. Mean revenues are $4,552 in the full sample and $4,457 in the subsample, with standard deviations of $1,362 and $1,264. The range of revenues is large, from approximately $1,000 to over $20,000, but per pupil spending increases smoothly over the entire range. 17 counties in the full sample and 7 in the urban sample have per pupil spending greater than twice the mean value.

The explanatory variables of main interest are those for elderly migration. Those aged 65 and higher make up fourteen to fifteen percent of the county's population, on average. This elderly group is broken down by migration characteristics. On average, the elderly who lived in the same county in 1985 and 1990 make up 11 to 12 percent of the county's population. Approximately 2.5% of the population consists of the elderly who migrated within a state, and an additional six tenths of a percent are elderly from out of state.

Kentucky and New Jersey court decisions addressed issues of both equity and adequacy. See Figlio, Husted, and Kenny (2001) for more discussion of these decisions.

Hypotheses

The key hypotheses to be explored are those related to migration of the elderly. If the elderly are self-interested and the external benefits they receive from education are relatively small, a higher proportion of elderly in a county should be associated with lower education spending. However, the migration patterns of retirees may mitigate this tendency. Community-based altruism implies that elderly nonmovers should not have a large negative effect on education spending. A larger proportion of retirees moving within the state may have a positive or negative impact on education; if positive, the effect should be smaller than that of the elderly nonmovers. If negative, it should be smaller in magnitude than the negative effect of a higher proportion of elderly inmigrants from out of state.

Community-based altruism should also be higher where the communities are smaller. This would suggest that a larger number of districts per hundred thousand population should be reflected by higher education spending, ceteris paribus. However, there should also be an offsetting competition effect, which will drive costs, and therefore expenditures, down as the number of districts increases.

A large literature suggests that the quality of education received by nonwhites is less than that of whites; this is presumably due to the historically inferior educational opportunities afforded to nonwhites. Lower educational quality is likely to be associated with lower demand for education. This would imply lower per pupil expenditures where a higher proportion of the population is nonwhite. Racial differences between the elderly and children may also cause lower education spending because the elderly may feel more altruism toward children who are more like them.

Education is generally accepted to be a normal good; higher median household income should be associated with higher spending on education. Increasing the price of education, however, should lead to less demand for it. An increase in the tax price variable, the ratio of median to mean income times the number of school-aged children per family, should thus have a negative effect.

Educational attainment is a commonly used proxy for permanent income, but higher educational attainment is also direct evidence of a taste for education. In either case, a larger fraction of the adult population with a college education should be associated with higher education spending.

Several authors, including Black, Figlio, and Harris, Evans and Schwab have shown or suggested that increases in education spending are capitalized into housing prices. A higher fraction of homeowners in a county should thus increase per pupil spending. An increase in the urbanicity of a county is expected to have a negative effect on per pupil spending because of economies of scale and other cost differences between urban and rural areas, such as the higher cost of transporting pupils for longer distances in rural areas. This will be offset to some extent by the higher wages paid in urban areas.

Results

The results of the ordinary least squares regressions with robust standard errors are presented in Table 2. State dummy variables are included in all specifications, and all variables in these regressions are in natural logarithms to yield elasticities and to reduce multicollinearity. The second column for each specification shows the result (in dollars of per pupil revenue) of a one standard deviation change in each explanatory variable. The first page contains the results of the regressions performed on the full sample; the second page contains the results for the urban sample.

(Insert Table 2)

The variables of primary interest are those related to age, racial mismatch and migration. When the migration patterns of retirees are taken into account, cross-cohort racial heterogeneity has no effect. The estimated elasticity of the racial mismatch term is not significantly different from zero in either sample.

Recall that my definition of racial mismatch differs somewhat from that of previous researchers. Poterba and Harris, Evans and Schwab use the simple difference between the nonwhite fraction of school-aged children and the nonwhite fraction of those aged 65 and older, while I use the absolute value of this difference. The absolute value measures cross-cohort racial heterogeneity, with the hypothesis that the elderly will be less likely to support education if they are of a different race than the local schoolchildren. The simple difference, however, has a different interpretation: an increase in this measure means there are proportionally either more nonwhite children or more white elderly, or both. The negative estimated effect that others have found for this variable implies that the white elderly may be racist. 97 counties in my sample have a negative mismatch value, for which the difference in definition matters. The results of my analysis do not change when the simple difference is used rather than the absolute value. This may be simply because such a small fraction of the sample is affected by the change in definition.

The mismatch variable captures one possible reason for a lack of connection between the old and young. The migration variables in my analysis capture this connection in a different way. The large, positive estimates for the elderly nonmovers in both samples are surprising. The benchmark group is all families not aged 65 and older that did not move, and who may or may not have children. The positive estimated elasticity suggests that elderly nonmovers are more likely to support education, compared to all other nonmovers. A one standard deviation increase in the log of the fraction of nonmovers increases revenues by $204 in the full sample and $167 in the urban subsample. Recall that the mean value of per pupil revenues is approximately $4,500.

The estimated elasticities of the migration coefficients only partially follow the predicted ordering. In the full sample, the estimated elasticity for instate movers is -0.02 and statistically significant, with one standard deviation rise leading to an estimated decrease of $46 in per pupil revenues. The elasticity for movers from another state is predicted to be more negative than this estimate, but the elasticity is -0.005. However, the dollar effect of -$47 is indeed more negative than the estimate for instate movers. The ordering of the migration coefficients in the urban subsample is also somewhat different from that predicted: the estimated elasticities for both categories of movers are not significantly different from zero. It is likely that these estimates are biased, however, because this model does not control for the endogeneity of location choice with respect to education spending.

The estimated elasticity for the number of school districts per hundred thousand population is positive and significant in both samples, as predicted. This result is consistent with the idea that support for education is likely to be higher where the community is smaller, because of the higher level of community-based altruism. The estimated elasticities are not large at 0.04 to 0.05, but the dollar effects associated with a one standard deviation increase in this variable range from a $226 to $312 increase in per pupil revenues.

The other variables in the models are intended as controls, but bear some discussion here. The estimated effect of increased median household income is positive and significant, as predicted, with estimated elasticities of 0.36 and 0.48. These elasticities are larger than those obtained by Ladd and Murray, but are consistent with the income elasticities more commonly found in the literature[6].

An increase in the nonwhite proportion of the population has no significant effect in either sample. This suggests that median household income captures all of the effects of educational quality. The estimated elasticity of the tax price variable is negative and significant in both samples, as predicted; as the price of education rises, less education is demanded. The estimated price elasticity is -0.18 for the full sample and -0.22 for the urban sample; the dollar effects of a one standard deviation increase in the tax price variable are -$84 and -$96, respectively.

[6] See Denzau and Grier (1984) for consistent estimates of key parameters affecting education spending.

As predicted, an increase in the fraction of the adult population with at least some college education has a positive effect on per pupil revenues. The fact that the estimated elasticities are significant is consistent with the idea that educational attainment is a signal of taste for education, and is not just a proxy for income. The effects are not large, though, with estimated elasticities of 0.10 to 0.12 and estimated dollar effects of $125 to $162.

The estimated effect of an increase in the fraction of homeowners is negative and significant in both samples. This is unexpected, but other researchers also have found a negative effect. The negative result has been explained as a renters' illusion effect, where renters do not believe property tax increases are borne by them. Hence, they will prefer higher school spending than otherwise identical homeowners.[7] These negative elasticities are fairly large, at -0.15 to -0.21, but the estimated dollar effects are only -$93 to -$158.

Finally, an increase in the fraction of the population living in an urban area has a negative effect in both samples. The estimated elasticities are small, ranging from -0.004 to -0.015, with estimated one standard deviation effects of -$41 to -$119 on per pupil revenues. The small size of the estimates is likely due to the offsetting cost differences between urban and rural areas, although the economy of scale effects and higher rural transportation costs dominate.

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[7] See, again, Denzau and Grier.

Controlling for the Effects of Tiebout Sorting

Researchers including Hoyt and Rosenthal (1997) offer evidence consistent with Tiebout's idea that households sort efficiently across locations to receive their preferred levels of public goods. The elderly can control their tax liabilities through location choice as well as through voting. Therefore, the proportion of elderly in a county is endogenous with respect to education expenditures. This makes bias likely in the coefficients from the ordinary least squares regressions. Harris, Evans and Schwab and Ladd and Murray attempt to control for this endogeneity using an instrumental variables approach. They instrument for the fraction elderly in a given year with the fraction aged 55 to 64 in the district (or county) 10 years before. Instead of using the fraction elderly in the county as the key explanatory variable, my model employs the migration variables, which sum to the fraction elderly. I use several instruments to directly explore the migration patterns of the elderly.

These instruments are employed in two-stage least squares and three-stage least squares frameworks. The advantage of the three-stage procedure is that the first stage includes only the variables that are dictated by theory. The two-stage process includes all the second-stage variables in the first stage regressions, which is less intuitively appealing. It avoids a serious problem of three-stage least squares, however, where misspecification of either equation in the system will contaminate the coefficients for the entire system.

Graves (1979) showed that areas with high variations in temperature or other manifestations of undesirable climates have lower inmigration for groups of all ages, ceteris paribus. This result should be particularly strong for elderly movers, as they do not face labor market constraints. Mean January temperature is included as an instrument to capture the effects of climate. The elderly would be expected to choose retirement homes in warm winter climates, so a higher mean January temperature should have a positive effect on elderly inmigration.

Graves considered weather as an example of amenities that affect migration decisions. Other amenities that appeal to the elderly include favorite leisure activities such as golf and going to the beach. Thus, coastal counties and those with more golf courses should attract more elderly movers. The number of golf courses in the county and a coastal dummy are included to capture these amenities. An interaction of temperature with the coastal variable is also included[8]. I expect the estimates for these variables to be positive, as beaches are best enjoyed in warm weather.

The standard deviation of land slope is also included, but the expectation for its effect is less clear. While anecdotal evidence suggests that retirees enjoy the scenic beauty of the mountains, the increased difficulty of transportation in rugged terrain may be undesirable to the elderly.

The cost of living has also been shown to be an important predictor of elderly migration[9]; the urbanicity measure is intended to capture the cost of living. Urban areas have higher costs of living due to higher land costs, so more urban areas should attract fewer elderly movers.

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[8] The interaction between golf courses and temperature could not be included because of collinearity; the simple correlation between the natural logarithms of the number of golf courses and the interaction term is 0.90.
[9] See Fournier, Rasmussen and Serow (1988).

Data on the number of golf courses in each county are supplied by the National Golf Foundation, and land slope data are from David Figlio and Joe Stone[10]. The coastal dummy was obtained by inspection of state maps. The fraction of the county's population living in an urban area is from the 1990 Census of Population.

The mean January temperature of each county (in degrees Fahrenheit) is derived from the National Oceanic and Atmospheric Administration's National Climactic Data Center files. These files include mean January temperature by weather station. The mean January temperatures for all stations in the county were averaged to derive the county mean January temperature. 467 counties do not have weather stations listed; for these counties, the mean January temperatures of the adjacent counties (or closest counties where there are no weather stations in the adjacent counties) were averaged. State maps showing county boundaries were used to determine the surrounding counties for this purpose.

The summary statistics for the determinants of elderly migration from another state are shown in Table 3.

(Insert Table 3)

As mentioned in the discussion of Table 1, the mean fraction of elderly from out of state is 0.006 in both samples. There is a great deal of variation in this fraction: the standard deviation is greater than the mean at 0.007, and the elderly from out of state make up more than 9 percent of the population at the maximum. Mean January

[10] Special thanks to David Figlio and Joe Stone for the land slope data.

temperature is approximately 37 degrees Fahrenheit, and ranges from one degree to 73 degrees Fahrenheit.

The supply of golf courses is quite varied across counties. The mean is just above 5 for the full sample and 6.6 for the urban sample, with a standard deviation of 9 to 10. The number of golf courses in each county ranges from zero to 170. There is also a great deal of variation in the land slope variable. The mean of the standard deviation of land slope is approximately 0.67, and ranges from 0.01 to 4.9.

Results

The results of the first stage regressions, which show the determinants of elderly migration to a county from out of state, are shown in Table 4.

(Insert Table 4)

The hypotheses for the determinants of elderly migration are, for the most part, supported by the results shown in Table 3. The dependent variable is the natural logarithm of the fraction of the population that is elderly and that migrated from out of state, and has a mean of -5.68 in the full sample (-5.49 in the subsample) and a standard deviation of 1.34 (0.89 in the subsample). It is in natural logarithm form to be consistent with the variables in the main regressions. The explanatory variables are also in logarithms to reduce collinearity.

The estimated effect of warmer January weather is positive and significant in all specifications. This effect is even stronger in the coastal counties in the three-stage specification, but the interaction term has no significant effect in the two-stage regressions. These results suggest that warmer winter weather is an important consideration for retirees deciding to move out of state, and becomes even more important in coastal areas.

A one standard deviation increase in the natural logarithm of January temperature is associated with a 0.0009 increase in the fraction of elderly inmigrants from out of state in the full sample, and a 0.0008 increase in the urban sample in the two-stage specifications. These increases appear small, but are substantial in relation to the size of the fraction of retirees from out of state, which has a mean of 0.006. The interaction of January temperature with the coastal dummy has no significant effect in the two-stage regressions.

The coastal interaction does have a significant effect in the three-stage regressions. If the county does not have a coast, a one standard deviation increase in the natural logarithm of January temperature is associated with a 0.0008 increase in the fraction of elderly inmigrants from out of state in the full sample, and a 0.0006 increase in the subsample. If the county does have a coast, the full effect is very large in relation to the mean of the dependent variable: an increase of 0.013 in the full sample and 0.017 in the urban sample.

More golf courses in the county are also associated with higher elderly migration from out of state in all specifications. A one standard deviation increase in the natural logarithm of the county's number of golf courses is associated with an increase in elderly migration from out of state ranging from 0.0003 to 0.0007 in the two-stage regressions, and from 0.0006 to 0.0011 in the three-stage regressions.

The land slope variable has a positive effect on the migration of retirees from out of state in all specifications. This effect is largest in the three-stage specifications, where it is estimated to increase migration by 0.001 in both the full and urban samples. The estimated effect in both two-stage regressions is 0.0005. This suggests that retirees enjoy the beauty of mountainous regions, notwithstanding the difficulties this may cause for transportation.

The full effect of coastal counties on migration is slightly more complex. The coastal dummy has no significant effect in the two-stage specifications. In the three-stage regressions, the coast has a positive effect on elderly migrants from out of state if the mean January temperature is above 23 degrees Fahrenheit for the full sample and 27 degrees for the urban sample. Only 332 counties of 2,348 have mean January temperatures below 23 degrees. Only one county (in Maine) has a seacoast and a mean January temperature below 23 degrees, while 19 counties with a coast on a Great Lake have such cold winters. Of the 1,750 counties in the urban subsample, 321 have mean January temperatures below 27 degrees, including 7 Maine counties with a seacoast and 23 counties with a Great Lake coast. These effects suggest that the elderly can better enjoy the coast in warmer weather.

The effect of urbanicity on elderly migration is mixed. The fraction of the county's population living in an urban area has a significant effect on elderly migration from out of state only in the three-stage regression performed on the urban sample. A higher level of urbanicity has the predicted negative effect in this specification. Urbanicity may affect migration in a nonlinear way. While more rural areas tend to have lower costs of living, extremely rural areas may not provide the amenities desired by the elderly, such as good hospitals and doctors.[11]

The results of the second stage of the two-stage and three-stage least squares regressions are shown in Table 5.

(Insert Table 5)

Again, the variables of primary interest are those related to age, racial mismatch and migration. Cross-cohort racial heterogeneity again has no effect in any specification. The elderly nonmover variable retains the positive estimates of the OLS specifications in all specifications, with a range in estimated elasticities of 0.12 to 0.15, which is quite close to the estimates in the OLS regressions. Again, the positive estimated elasticity suggests that elderly nonmovers are more likely to support education, compared to all residents under the age of 65. A one standard deviation increase in the log of the fraction of nonmovers increases revenues (which have a mean of approximately $4,500) by $167 to $222.

The estimated elasticities of the migration variables follow the predicted ordering in the full sample regressions. In both urban specifications, the only migration variable that has an effect significantly different from zero is the nonmover category. The estimated elasticities for the nonmovers in these specifications are positive and significant, so the ordering is partially correct.

[11] The results do not change if the specification includes a quadratic urbanicity term, however.

The elderly movers from out of state have negative and significant estimated elasticities in the regressions performed on the full sample.; these estimates, at -0.03 to -0.05, are much larger than those in the ordinary least squares specifications. The dollar effects of a one standard deviation increase in the log of the fraction of inmigrants from out of state range from $203 to $222 where they are significantly different from zero.

The estimated elasticity for the number of school districts per hundred thousand population is positive and significant all specifications, with a range of 0.04 to 0.05. This result is consistent, as in the OLS regressions, with the idea that support for education is likely to be higher where the community is smaller. The dollar effects associated with a one standard deviation increase in this variable range from a $225 to $301 increase in per pupil revenues.

The estimated effect of increased median household income is positive and significant in all specifications, with estimated elasticities ranging from 0.36 to 0.49. These elasticities are close to the ones found in the OLS specifications, and are larger for the urban sample in both specifications.

An increase in the nonwhite proportion of the population has no significant effect in any regression. This offers more evidence that median household income captures all of the effects of educational quality. The estimated elasticity of the tax price variable is negative and significant in all regressions, as we would expect of an own price elasticity. The price elasticities, which range from -0.18 to -0.23, are close to the OLS estimates. The dollar effects of a one standard deviation increase in the tax price variable range from -$83 to -$105.

As predicted, an increase in the fraction of the adult population with at least some college education again has a positive effect on per pupil revenues; this is consistent with the idea that educational attainment is a signal of taste for education. The effects are a bit larger than those found in the OLS specifications, with estimated elasticities ranging from 0.10 to 0.14 and estimated dollar effects of $125 to $190.

The estimated effect of an increase in the fraction of homeowners is negative and significant in all specifications, as it was in the OLS regressions. Again, this may be due to a renters' illusion effect, where renters do not believe property tax increases are borne by them, causing them to prefer higher school spending than otherwise identical homeowners. These estimated elasticities are somewhat smaller than those found in the OLS regressions; they range from -0.15 to -0.20 and have estimated dollar effects of -$93 to -$159.

Finally, an increase in the fraction of the population living in an urban area has a negative effect in all four specifications. The estimated elasticity remains small at -0.004 to -0.02, and has an estimated one standard deviation effect of -$42 to -$115 on per pupil revenues. The small size of the estimates is again likely due to the offsetting cost differences between urban and rural areas. The negative sign indicates that economy of scale effects and higher rural transportation costs dominate.

Conclusion

Previous researchers have found the proportion of elderly in an area to have a negative or insignificant effect on education spending. However, long-time older residents should be more willing to support education than new elderly residents if duration of residence fosters a sense of community. The results from my county-level cross-section model are consistent with this idea. An increase in the fraction of elderly nonmovers is shown to increase per-pupil spending, while the elderly who migrate from another state or county are less willing to support education. This effect is especially large when instruments to control for Tiebout endogeneity are included.

I also find cross-cohort racial heterogeneity to have no significant effect on education spending. Racial differences may be a reason the elderly do not relate to the youth of a community, but my results indicate that long-term residence of the elderly offsets this potential source of discord.

References

Andreoni, James, Cooperation in Public-Goods Experiments: Kindness or Confusion? *American Economic Review* v85, n4 (September 1995): 891 - 904

Baker, Dean and Weisbrot, Mark, *Social Security: The Phony Crisis*, Chicago and London: University of Chicago Press (1999)

Black, Sandra E., Do Better Schools Matter? Parental Valuation of Elementary Education, *Quarterly Journal of Economics,* v114, n2 (May 1999): 577 - 599

Center for International Earth Science Information Network (CIESIN), Socioeconomic Data and Applications Center (SEDAC). 1996. Archive of Census Related Products [online]. Palisades, NY: CIESIN/SEDAC. <http://sedac.ciesin.org/plue/cenguide.html>

Denzau, Arthur and Grier, Kevin, Determinants of Local School Spending: Some Consistent Estimates, *Public Choice,* v44 (1984): 375 - 383

Figlio, David, Husted, Thomas A., and Kenny, Lawrence W., Constitutions, Court Decisions, and Inequality in School Spending, University of Florida Working Paper (June 2001)

Figlio, David and Lucas, Maurice, What's in a Grade? School Report Cards and House Prices, NBER working paper 8019 (November 2000)

Figlio, David and Stone, Joe A., Competition and Stratification, University of Florida Working Paper (January 2001)

Fournier, Gary M., Rasmussen, David W. and Serow, William, Elderly Migration as a Response to Economic Incentives, *Social Science Quarterly,* v69, n2 (June 1988): 245 - 260

Graves, Philip E., Income and Migration Revisited, *The Journal of Human Resources,* v14, n1 (Winter 1979): 112 - 121

Harris, A. R., Evans, W.N., and Schwab, R.M., Education Spending in an Aging America, *Journal of Public Economics,* v81, n2 (September 2001): 449 - 472

Hoyt, William H. and Rosenthal, Stuart S., Household Location and Tiebout: Do Families Sort According to Preferences for Locational Amenities? Journal of Urban Economics, v42 (1997): 159 - 178

Inman, Robert P., Markets, Governments and the New Political Economy, in Alan J. Auerbach and Martin Feldstein (eds.), *Handbook of Public Economics*, Volume 2, Amsterdam: North Holland (1987)

Kemnitz, Alexander, Social Security, Public Education and Growth in a Representative Democracy, *Journal of Population Economics*, v13, n3 (August 2000): 443 - 462

Ladd, Helen F. and Murray, Sheila E., Intergenerational Conflict Reconsidered: County Demographic Structure and the Demand for Public Education, *Economics of Education Review* v20, n4 (August 2001): 343 – 357

Lovell, Michael C., Spending for Education: The Exercise of Public Choice, *The Review of Economics and Statistics,* v60, n4 (November 1978): 487 - 495

National Oceanic and Atmospheric Administration, NNDC Climate Data Online, generated by Deborah Fletcher; <http://cdo.ncdc.noaa.gov/cgi-bin/cdo/cdoprod.pl>

Palfrey, Thomas R. and Prisbey, Jeffrey E., Anomalous Behavior in Public Goods Experiments: How Much and Why? *American Economic Review* v87, n5 (December 1997): 829 - 846

Poterba, James M., Demographic Change, Intergenerational Linkages and Public Education, *American Economic Review* v88, n2 (May 1998): 315 - 320

Poterba, James M., Demographic Structure and the Political Economy of Public Education, *Journal of Policy Analysis and Management* v16, n1 (Winter 1997): 48 - 66

Preston, Samuel, Children and the Elderly in the United States, *Demography* v 21 (1984): 435 - 457

Schultz, James H., *The Economics of Aging,* 6th Edition, Westport, CT and London: Auburn House (1995)

U.S. Census Bureau, 1990 Census of Population and Housing, Summary Tape Files 1 and 3; generated by Deborah Fletcher, using American Fact Finder; <http://factfinder.census.gov/servlet/BasicFactsServlet>

U.S. Census Bureau, "Federal, State and Local Governments: 1992 Public Elementary-Secondary Education Finance Data," released November 29, 1995, <http://www.census.gov/govs/www/school92.html>

U.S. Census Bureau, *County and City Data Book: 1996*, generated by Deborah Fletcher using WWW data access from the University of Virginia's GEOSTAT; <http://fisher.lib.virginia.edu/ccdb/county94.html>

U.S. Department of Education, National Center for Education Statistics, *Digest of Education Statistics, 1997*, NCES 98-015, by Thomas D. Snyder. Production Manager, Charlene M. Hoffman. Program Analyst, Claire M. Geddes. Washington, DC: 1997

Table 1: Sample Summary Statistics
Full Sample

Variable	Mean	Standard deviation	Minimum	Maximum
Per pupil state plus local revenue	4,552	1,362	1,032	20,340
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990 [1]	0.1194	0.0353	0.0108	0.2810
Fraction of the county's population that is aged 65 and older and that moved from within the state but not the county	0.0252	0.0096	0.0000	0.0776
Fraction of the county's population that is aged 65 and older and that moved from out of state	0.0056	0.0066	0.0000	0.0931
School districts per hundred thousand population	25.51	57.72	0.05	1,298.70
Fraction nonwhite	0.1227	0.1604	0.0000	0.9490
Nonwhite share aged 5 to 17 less nonwhite share aged 65 and older	0.0669	0.0758	0.0000	0.4596
Median household income	24,073	6,096	9,791	54,801
Tax price	2.1601	0.2339	0.8005	5.2211
Fraction of the county's population aged 25 and older with at least some college	0.3519	0.1052	0.1170	0.8120
Per pupil federal revenue	372.66	329.46	0.00	6,775.44
Fraction homeowner	0.6258	0.0919	0.1010	0.8270
Fraction urban	0.3462	0.2853	0.0000	1.0000

Urban subsample

Variable	Mean	Standard deviation	Minimum	Maximum
Per pupil state plus local revenue	4,457	1,264	1,032	20,340
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990 [1]	0.1122	0.0306	0.0108	0.2175
Fraction of the county's population that is aged 65 and older and that moved from within the state but not the county	0.0245	0.0086	0.0016	0.0776
Fraction of the county's population that is aged 65 and older and that moved from out of state	0.0057	0.0071	0.0000	0.0931
School districts per hundred thousand population	14.68	20.46	0.05	475.66
Fraction nonwhite	0.1241	0.1490	0.0005	0.9490
Absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older	0.0702	0.0727	0.0000	0.4354
Median household income	25,172	6,219	9,791	54,801
Tax price	2.1782	0.2321	1.4112	5.2211
Fraction of the county's population aged 25 and older with at least some college	0.3634	0.1064	0.1530	0.8120
Per pupil federal revenue	342.05	284.40	60.26	6,775.44
Fraction homeowner	0.6334	0.0822	0.1910	0.8270
Fraction urban	0.4645	0.2330	0.0006	1.0000

Demographic and migration data are from 1990 and school finance data are from 1992. The full sample is made up of the 2348 counties from the 38 continental states that have no state legislation mandating increased equality of education expenditures. The urban subsample is made up of the 1750 observations in the full sample for which the fraction rural is less than 1.

Table 2: Determinants of Per Pupil State and Local Revenue for Education
County-level cross-section (1990), Ordinary Least Squares Regressions

Full sample	*Elasticity*	*Effect of a one SD change in X*
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990 1	0.1409 (0.0274)	204.39
Fraction of the county's population that is aged 65 and older and that moved from within the state but not the county	-0.0161 (0.0087)	-46.46
Fraction of the county's population that is aged 65 and older and that moved from out of state	-0.0080 (0.0029)	-46.56
School districts per hundred thousand population	0.0534 (0.0091)	312.48
Fraction nonwhite	0.0036 (0.0058)	
Absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older	-0.0049 (0.0058)	
Median household income	0.3634 (0.0555)	398.41
Tax price	-0.1830 (0.0571)	-83.99
Fraction of the county's population aged 25 and older with at least some college	0.1218 (0.0239)	161.57
Per pupil federal revenue	-0.0018 (0.0340)	
Fraction homeowner	-0.2062 (0.0316)	-158.15
Fraction urban	-0.0042 (0.0006)	-119.10
R squared	0.7339	

Urban subsample	*Elasticity*	*Effect of one SD change in X*
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990 1	0.1247 (0.0388)	167.36
Fraction of the county's population that is aged 65 and older and that moved from within the state but not the county	0.0041 (0.0155)	
Fraction of the county's population that is aged 65 and older and that moved from out of state	-0.0043 (0.0045)	
School districts per hundred thousand population	0.0433 (0.0108)	225.59
Fraction nonwhite	-0.0043 (0.0087)	
Absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older	0.0018 (0.0057)	
Median household income	0.4781 (0.0633)	508.61
Tax price	-0.2214 (0.0808)	-96.19
Fraction of the county's population aged 25 and older with at least some college	0.0995 (0.0300)	125.31
Per pupil federal revenue	0.0748 (0.0377)	164.31
Fraction homeowner	-0.1495 (0.0410)	-93.08
Fraction urban	-0.0150 (0.0059)	-41.48
R squared	0.7303	

The second column is the effect, in dollars of per pupil revenue, of a one standard deviation change in the explanatory variable. All variables are in natural logarithms. All specifications include state dummies. Individuals are considered nonmovers if they moved within the county. Demographic and migration data are from 1990 and school finance data are from 1992. The full sample is made up of the 2348 counties from the 38 continental states that have no state legislation mandating increased equality of education expenditures. The urban subsample is made up of the 1750 observations in the full sample for which the fraction rural is less than 1.

Table 3: Summary Statistics for the Determinants of Elderly Migration

Full sample	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Fraction of the population that is aged 65 and older and that lived in the same county in 1985 and 1990	0.0056	0.0066	0.0000	0.0931
Mean January temperature	36.29	12.03	1.20	73.23
Number of golf courses in the county	5.22	9.02	0.00	170.00
Standard deviation of land slope	0.6810	0.9250	0.0097	4.8691
Fraction of the population living in an urban area	0.3462	0.2853	0.0000	1.0000

Urban Subsample	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Fraction of the population that is aged 65 and older and that lived in the same county in 1985 and 1990	0.0057	0.0071	0.0000	0.0931
Mean January temperature	37.25	11.71	1.20	73.23
Number of golf courses in the county	6.56	10.07	0.00	170.00
Standard deviation of land slope	0.6661	0.8977	0.0097	4.8477
Fraction of the population living in an urban area	0.4645	0.2330	0.0006	1.0000

The full sample is made up of the 2348 counties from the 38 continental states that have no state legislation mandating increased equality of education expenditures. The urban subsample is made up of the 1750 observations in the full sample for which the fraction rural is less than 1.

Table 4: Determinants of Elderly Migration from Out of State
From county-level cross-section (1990)

	2SLS		***3SLS***	
	Full sample	*Urban Subsample*	*Full sample*	*Urban subsample*
Mean January temperature	0.5305 (0.1555)	0.4659 (0.1155)	0.4942 (0.0729)	0.3693 (0.0606)
Number of golf courses in the county	0.0346 (0.0065)	0.0287 (0.0077)	0.0546 (0.0062)	0.0489 (0.0082)
Coastal dummy	-0.1767 (0.9784)	-0.0707 (0.6412)	-3.0812 (0.8400)	-4.2112 (0.6289)
Interaction of January temperature and the coastal dummy	0.0847 (0.2695)	0.0359 (0.1765)	0.9788 (0.2312)	1.2795 (0.1724)
Standard deviation of land slope	0.1275 (0.0382)	0.1269 (0.0274)	0.2283 (0.0257)	0.2416 (0.0195)
Fraction of the population living in an urban area	-0.0036 (0.0051)	-0.1664 (0.0364)	0.0005 (0.0045)	-0.0157 (0.0326)

All variables are in natural logarithms. The two-stage specifications include state dummies, as well as the natural logarithms of the number of school districts per hundred thousand population, nonwhite fraction of the population, absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older, median household income, mean income divided by mean income times the mean number of school-aged children per household, fraction of the population aged 25 and older with at least some college, per pupil federal revenue, fraction homeowner and fraction urban. Demographic and migration data are from 1990 and school finance data are from 1992. The full sample is made up of the 2348 counties from the 38 continental states that have no state legislation mandating increased equality of education expenditures. The urban subsample is made up of the 1750 observations in the full sample for which the fraction rural is less than 1.

Table 5: Determinants of Per Pupil State and Local Revenue for Education
County-level cross-section (1990), Two-Stage and Three-Stage Least Squares Regressions

	Two-Stage Least Squares		*Three-Stage Least Squares*	
Full sample	*Elasticity*	*One SD change in X*	*Elasticity*	*One SD change in X*
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990	0.1531	222.39	0.1398	202.69
	(0.0296)		(0.0181)	
Fraction of instate movers	0.0004		-0.0195	-56.18
	(0.0112)		(0.0085)	
Fraction of out of state movers	-0.0534	-302.82	-0.0334	-191.94
	(0.0220)		(0.0184)	
School districts per hundred thousand Population	0.0449	260.86	0.0515	300.73
	(0.0105)		(0.0058)	
Fraction nonwhite	0.0021		0.0026	
	(0.0063)		(0.0038)	
Absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older	-0.0048		-0.0050	
	(0.0061)		(0.0032)	
Median household income	0.3629	397.81	0.3670	402.51
	(0.0579)		(0.0295)	
Tax price	-0.2288	-104.78	-0.1811	-83.14
	(0.0661)		(0.0500)	
Fraction of the county's population aged 25 and older with at least some college	0.1429	190.12	0.1206	159.92
	(0.0280)		(0.0233)	
Per pupil federal revenue	0.0017		-0.0030	
	(0.0350)		(0.0069)	
Fraction homeowner	-0.2024	-155.27	-0.2072	-158.89
	(0.0339)		(0.0233)	
Fraction urban	-0.0040	-114.83	-0.0038	-108.26
	(0.0007)		(0.0006)	

Urban subsample	Two-Stage Least Squares Elasticity	Two-Stage Least Squares One SD change in X	Three-Stage Least Squares Elasticity	Three-Stage Least Squares One SD change in X
Fraction of the county's population that is aged 65 and older and that did not move between 1985 and 1990	0.1247 (0.0389)	167.36	0.1247 (0.0241)	167.41
Fraction of instate movers	0.0043 (0.0225)		0.0044 (0.0218)	
Fraction of out of state movers	-0.0046 (0.0297)		-0.0047 (0.0284)	
School districts per hundred thousand Population	0.0432 (0.0116)	225.23	0.0432 (0.0059)	225.23
Fraction nonwhite	-0.0043 (0.0087)		-0.0043 (0.0067)	
Absolute value of the nonwhite share aged 5 to 17 less the nonwhite share aged 65 and older	0.0018 (0.0058)		0.0018 (0.0056)	
Median household income	0.4783 (0.0660)	508.79	0.4784 (0.0379)	508.87
Tax price	-0.2219 (0.0943)	-96.40	-0.2223 (0.0730)	-96.58
Fraction of the county's population aged 25 and older with at least some college	0.0996 (0.0330)	125.48	0.0998 (0.0304)	125.72
Per pupil federal revenue	0.0748 (0.0376)	164.31	0.0748 (0.0119)	164.26
Fraction homeowner	-0.1496 (0.0438)	-93.14	-0.1497 (0.0344)	-93.21
Fraction urban	-0.0151 (0.0077)	-41.64	-0.0151 (0.0082)	-41.76

All variables are in natural logarithms. All specifications include state dummies. Demographic and migration data are from 1990 and school finance data are from 1992. The full sample is made up of the 2348 counties from the 38 continental states that have no state legislation mandating increased equality of education expenditures. The urban subsample is made up of the 1750 observations in the full sample for which the fraction rural is less than 1.