The Journal of
Regional
Analysis
& Policy

JRAP 47(1): 1-11.

The Spillover Effect of Ethnic Heterogeneity on Per-Pupil Expenditures

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Abstract: In this study, I estimate the spillover effect of increased ethnic heterogeneity on per-pupil spending using a three-year panel of United States school districts. While there is general consensus that higher ethnic heterogeneity decreases public good provision, there is little research on the potential spillover effects of increased ethnic heterogeneity on public good provision. The focus is on two measures of ethnic heterogeneity: the fragmentation index and the polarization index. Both of these indices disaggregate ethnic groups, which is an improvement over studies that use the share of the population that is not White as a proxy for racial mix. Both of these measures better reflect the tension that arises with local public good provision (Alesina, Baqir, and Easterly, 1999; Ajilore and Smith, 2011). In addition to using more appropriate measures of ethnic heterogeneity, this paper makes a contribution through the proper calculation of spillover effects from spatial models. The findings show greater ethnic heterogeneity has negative spillover effects on per-pupil expenditures. The public finance implications of these demographic changes are important since there will be not only increases in ethnic heterogeneity but also the geographic distribution of this heterogeneity.

1. Introduction

In Jonathan Kozol's 1992 book, *Savage Inequalities*, he detailed massive inequalities in resources among schools across the United States. Kozol determined that these differences occurred across both race and class. A question not answered in that book is what drove these inequalities across schools and school districts. In the time since that book was written, these inequalities have persisted. Baker and Corcoran (2012) show that even with court-ordered school finance reform systems, there are growing inequalities in spending across school districts. One hypothesis that has been tested in the literature relates school district demographics and per-pupil expenditures. The primary focus within this literature has been on the elderly population (Ladd and Murray, 2001; Harris, Evans, and Schwab, 2003; Figlio and Fletcher, 2012). The general consensus is that having a greater proportion of the elderly in the school district leads to lower per-pupil expenditures. The other focus, though not as prevalent, has been on the distribution of ethnic groups within the school districts.

Issues of ethnic heterogeneity[1] and support for local public goods, such as education, have been at the forefront of education debates in public finance literature. There is a coming ethnic demographic shift, especially among the youth population (Johnson and Lichter, 2013). Schools have become increasingly ethnically heterogeneous, although some argue that this change has led to re-segregation rather than integration (Fiel, 2013; Frankenberg and

[1] I use the term heterogeneity, although it can be thought of as diversity.

Orfield, 2012). Such developments will have broad implications for public education. Because public school financing comes primarily from property taxes and school levies, lower financial support in districts may occur due to increasing ethnic heterogeneity. The results of several studies show that support for public spending is inversely related to ethnic heterogeneity (Ajilore, 2011; Alesina et al., 2001; Colburn and Horowitz, 2003; Cutler et al., 1993). Alesina, Baqir, and Easterly (1999) argue that heterogeneity of preferences among racial and ethnic groups can lower total spending on public goods. These changes may also affect neighboring local public finance. Only scarce research has investigated the potential spillover effects of the changing demographic structure.

This paper analyzes the relationship between ethnic heterogeneity and school district expenditures with an emphasis on the potential spillover effects of demographic changes on neighboring school districts. These spillover effects are estimated using the Spatial Durbin Model, which models the spatial dependence in the explanatory variables as well as the dependent variable. This methodology has been used recently to analyze state health expenditures (Bose, 2015), ozone pollution (Lin, 2010), and food stamp participation (Lacombe et al., 2012). Using a three-year national panel of U.S. school districts, the results show that ethnic heterogeneity, as measured by both the fragmentation index and the polarization index, has negative spillover effects. This result is important because the ethnic composition of school districts (and regions in general) will become increasingly complex in the future, and it is imperative to understand the implications not only for a given school district but also for neighboring school districts. The format of this study is as follows: Section II explores attitudes about race and education, Section III outlines the data and methodology, Section IV presents the results, Section V discusses the results, and Section VI presents the paper's conclusions.

2. Perceived neighborhood ethnic composition and support for education

The spillover effect of ethnic heterogeneity may be driven by perceived changes in the ethnic composition of neighboring districts. To test how perceived neighborhood ethnic composition has an impact on support for education spending, data from the General Social Survey (GSS) is used. The questionnaire covers a variety of issues ranging from religion to education to crime. The dataset runs from 1972 to 2012, though the years are not consecutive. Luttmer (2001) uses the GSS to explain attitudes toward welfare spending and how they vary depending on race and other demographic characteristics. Luttmer finds that racial differences pertain to the level of spending on welfare programs. African Americans are more supportive of welfare spending than other groups.

In the GSS, race is coded as White, Black, or Other. These categories ignore both Hispanics and Asians, whose proportion of the population is increasing. In GSS, there is a measure of ethnicity that asks for the country of origin or ancestry of the respondent (Smith, 1995). The respondent can choose from approximately forty provided countries. The ethnicity variable used in this study is coded as White, Black, Hispanic, or Asian. Hispanic is chosen for the following countries of origin: Spain, Mexico, Puerto Rico, Portugal, and 'other Hispanic.' Asian is chosen for the following counties of origin: Japan, China, India, and 'other Asian.' The analysis performed here focuses on finding differences based on ethnicity and on creating a proxy for ethnic heterogeneity to estimate its impact on support for education spending using a multinomial logistic regression. To represent support for public education, this study relies on the measure NATEDUC, which asks how much the government should be spending to improve the education system. The respondent can answer "too little," "about right," or "too much." Respondents who favor increased education spending would answer "too little," and those who do not favor increased education spending would answer "too much." As a proxy for ethnic heterogeneity, RACLIVE asks about the racial demographics in the respondent's neighborhood. Respondents who answer "yes" tend to live in ethnically heterogeneous areas. A second proxy for ethnic heterogeneity is RACDIS, which asks how many blocks away a person of the opposite race[2] lives from the respondent. The choices are "same block," "1-3 blocks away," "4-8 blocks," and "over 8 blocks away." RACHAF asks whether the respondent opposes having his or her children in a school where half of the school population is of a different race.[3] This measure is used to capture attitudes about race and education. The hy-

[2] This term is taken directly from the GSS questionnaire. However, from this point on we will instead use "different race" to better account for multiple groups.

[3] There are other questions that change the school population mix, but I report only the results for RACHAF. The results using the other questions were not different.

pothesis is that as schools become more ethnically diverse support for education decreases. The first analysis performed involves cross-tabulations of the race- and ethnicity-related measures with demand for education spending. Table 1 gives the results of the cross-tabulations.

Table 1. Cross-tabulations of support for education with race and ethnicity measures.

	Spending to Improve the Nation's Education			
Race of Respondent	Too Little	About Right	Too Much	Pearson χ^2
White	61.80	30.23	7.97	410.18***
Black	75.87	22.17	1.96	
Other	67.13	28.48	4.39	
Ethnicity of Respondent				
Non-Hispanic White	61.70	30.14	8.17	438.06***
Black	75.99	22.44	1.98	
Hispanic	65.28	31.02	3.70	
Asian	65.36	29.98	4.67	

*Source: General Social Survey (GSS); *** statistically significant at the 1% level.*

Pearson's χ^2 is significant for each cross-tabulation; thus, the responses are related to race. African Americans are more likely to support spending on education and Whites are the least likely not to support more spending. While Hispanics and Asians have similar dispositions toward wanting more spending, Asians are more likely to think that too much is being spent on education. Hispanic and Asians do not support education to the extent that African Americans support it, which would be missed in studies using Share Non-white as a measure of minority preferences.

Table 2. Cross-tabulations of support for education with neighborhood heterogeneity measures.

	Spending to Improve the Nation's Education			
How Far Away Is the Closest Person of the Opposite Race?	Too Little	About Right	Too Much	Pearson χ^2
Same block	65.26	28.28	6.46	40.22***
1-3 blocks	61.23	30.68	8.09	
4-8 blocks	58.35	33.22	8.43	
Over 8 blocks	56.41	33.70	9.89	
Any Opposing Race in the Neighborhood?				
Yes	63.54	29.10	7.36	13.44***
No	59.41	32.56	8.03	
Object to Having Children in School with Half Opposing Race?				
Yes	52.92	37.20	9.87	69.11***
No	61.99	30.98	7.03	

*Source: General Social Survey (GSS); *** statistically significant at the 1% level.*

The results show that ethnicity plays a role in whether respondents support education. The cross-tabulations show that individuals who are open to mixed-race environments support more spending on education. Respondents who live in mixed-ethnicity neighborhoods are more likely to support more spending on education. Respondents who do not mind having their children in mixed-race schools are more likely to support more spending on education. These preliminary results show that increased fragmentation may not necessarily lead to lower spending. The increases in heterogeneity will depend on the nature of who is moving into the area and their views of other ethnic groups. Another finding from Table 2 is that respondents who live farther from someone of a different race tend to believe that too much is spent on education. While increased heterogeneity has an uncertain effect of education spend-

ing, increased heterogeneity in a neighboring district may lead to lower education spending through lower support for education.

The next analysis uses a multinomial logistic regression to estimate how ethnicity affects attitudes toward education spending while controlling for income, gender, marital status, number of children, educational attainment, and city size. RACDIS is recoded as an ordinal variable for which higher values signify that the respondent lives farther from someone of a different race. The other two measures are recoded as a (0,1) variable to facilitate the interpretation of the results. The dummy variable for RACLIVE takes the value 1 if the respondent answers "Yes" to the question of whether there are members of a different race in the neighborhood. The dummy variable for RACHAF takes the value 1 if the respondent answers "Yes" to the question of whether they object to having half of the school population of another race. Table 3 provides the results of the estimation.

Table 3. Multinomial Logit Model of ethnic heterogeneity on support for public education.

Spending on Improving Education System	**Too Little**	**Too Much**	**N**
How Far Are the Closest of Opposite Race? (Number of blocks away)	-0.1082*** (0.037)	-0.0147 (0.075)	4,782
Object to Having Children in School with Half Opposing Race?	-0.2785*** (0.074)	0.2198 (0.138)	6,831
Any Opposing Race in the Neighborhood?	0.2753*** (0.041)	0.2256*** (0.082)	14,83 9

**** Statistically significant at the 1% level; standard errors in parentheses; marginal effects reported; controls include income, gender, marital status, number of children, educational attainment, and city size.*

The farther the respondent lives from someone of a different race, the less likely they are to believe that too little is being spent on education. Respondents who oppose having children in mixed-race schools are less likely to feel that too little is being spent on education. If the neighborhood is mixed, respondents are more likely to feel that too little is being spent on education, but a portion of respondents feel too much is being spent on education. These results show that attitudes toward the level of education spending are affected by respondents' views of race and ethnicity. These results also show that although respondents are less likely to believe that too little is spent on education, they do not believe that too much is being spent on education. This distinction is important because it shows that respondents may not actively desire less education spending. Given the results of the analysis, ethnic heterogeneity may play a large role in the demand for education spending. However, it cannot be stated with certainty that increased ethnic heterogeneity will lead to lower public education spending. In the following sections, a panel of U.S. school districts is constructed to test the relationship between ethnic heterogeneity and per-pupil spending.

3. Data and methodology

The functional form used to estimate the model follows Poterba (1997), in which education spending is a function of several factors related to the demand for public education. The dependent variable is per-pupil expenditures, which takes education spending and divides it by the enrollment in the district. School districts finance education primarily through property taxes. In several states, there are school district-specific income taxes that augment property tax financing. Due to inequalities in districts' capacity to finance schools, there have been a number of court cases trying to overturn the current system. States that have overturned their financing scheme have set up equalization schemes to counteract inequalities. Hill and Kiewet (2015) find that decisions to overturn financing schemes that are based on adequacy rather than equity have led to greater levels of overall spending but not to the equalization of spending across districts.

Two measures of ethnic heterogeneity are used in this study. The first measure is the fragmentation index, which is the probability that two persons chosen at random from a given population will be of a

different race or ethnicity. The calculation is shown below:

$$Ethnic\ Fragmentation\ = 1 - \sum \pi_i^2 \quad (1)$$

where π_i is the proportion of the population that is of ethnicity i. Higher values of Fragmentation mean that the population is more heterogeneous. This is the most common measure of racial and ethnic diversity (Alesina and La Ferrara, 2005). The second measure, taken from the development literature, is the polarization index. The formula for the polarization measure is given in (2):

$$Polarization\ Index\ = 1 - \sum \left(\frac{0.5-\pi_i}{0.5}\right)^2 * \pi_i \quad (2)$$

This measure is an index of potential conflict for garnering resources among groups. As the number of groups increase, the potential for conflict increases. This measure has not been used in the context of the United States; it has been used primarily to predict civil wars and ethnic conflict. One benefit of the polarization index is that it accounts for distance between groups, i.e., some groups are more different than others (Lind, 2007). This measure incorporates an argument outlined by Culter, Elmendorf, and Zeckhauser (1993) indicating that an individual incurs lower utility when public-good spending is shared by others from a different ethnic group.

As described earlier, the focus is on ethnic heterogeneity rather than racial heterogeneity. With racial heterogeneity, the racial breakdown is composed of Whites, Blacks, Native Americans, Asians (including Native Hawaiian and Pacific Islander), and Other. Sometimes, Other is taken to include Hispanics. While the correlation between Other and Hispanic is high in early census years, this is definitely not the case with more current censuses (see Rodriguez, 2000). Ethnic group shares are included to control for baseline levels of each ethnic group (Rushton, 2008; Vigdor, 2002). In addition to ethnic fragmentation, the other demographic variables include the percent owner-occupied, elderly share[4], youth share, median household income, college educated share, urban share, and number of households. The financial variables include per-pupil federal aid, the share of revenue that comes from the state, and three dummy variables to account for states that had court-ordered finance reform[5].

Creating a district-level panel dataset is difficult because the sources of demographic data and financial data are not consistent across years. Several authors have created similar types of datasets to estimate models related to issues of education finance reform (see Corcoran and Evans, 2008; Harris et al., 2001; Hoxby, 1996). Due to accuracy issues associated with the Hispanic population data, this dataset covers the census years between 1980 and 2000. The demographic data are taken from the 1980 Census of Population and Housing Summary Tape File 3F, the 1990 School District Databook, and the 2000 School District Databook. The School District Databook contains files developed from the National Center for Education Statistics (NCES) website. Following the convention in the literature, the financial data are taken from the 1982 and 1992 Census of Governments: School Districts and the 2002-03 F-33 School System Finance File. There are 8,069 districts reviewed over three years; thus, the total number of observations is 24,207. The data are weighted by district population, and all financial variables are in 2000 dollars. Table 4 shows a summary of the variables.

The strategic behavior exhibited by school districts motivates the use of spatial econometric models. The equation for the spatial autoregressive (SAR) model, the basic spatial econometrics panel data model (i represents the school district and t is the year) is as follows:

$$y_{it} = \lambda \sum_{j=1}^{N} w_{ij} y_{jt} + x_{it}\beta + \mu_i + \nu_t + \varepsilon_{it} \quad (3)$$

where y_{it} is a function of a weighted average of neighboring regions' outcomes (y_{jt}) and a set of independent variables (x_{it}). This model includes both a spatial fixed effect (μ_i) and a time fixed effect (ν_t). w_{ij} represents the spatial weight matrix that quantifies the relationship between the observations. If λ is significantly different from zero, then the dependent variable exhibits spatial dependence, indicating that the actions in one region are correlated with those of a neighboring region. In the spatial econometrics literature, neighbors are usually defined as regions that share a common border, but a variety of weight matrix specifications exist.

[4] To account for the potential endogeneity of the elderly population, I use the share of the population between the ages of 55 and 64 in the school district the prior census year as an instrument (Harris et al., 2001).

[5] Information on the three types of reform are taken from Table 1 of Hill and Kiewiet (2014).

Table 4. Summary of variables.

Variable	Total	1980	1990	2000
Per-Pupil Spending	6,962.56	5,066.76	7,356.09	8,140.28
Ethnic Fragmentation	0.1781	0.1223	0.1675	0.2446
Polarization Index	0.3041	0.2305	0.3033	0.3784
Elderly Share	0.12	0.11	0.13	0.12
Owner-occupied	0.67	0.68	0.66	0.68
Median Household Income	32,089.79	17,661.47	31,238.16	44,449.65
Youth Share	0.19	0.16	0.22	0.19
Urban Share	0.73	0.61	0.75	0.80
College-educated	0.18	0.06	0.22	0.24
Per-child Federal Aid	336.36	35.36	421.97	502.94
State Revenue Share	0.60	0.81	0.47	0.53
Reform (Equity)	0.17	0.099	0.209	0.210
Reform (Adequacy)	0.10	0.031	0.051	0.208
Reform (Lower)	0.02	0	0	0.065
Number of Households	112,787	101,356	108,066	126,153
Black Share	0.06	0.052	0.055	0.058
Native Share	0.01	0.010	0.012	0.012
Asian Share	0.01	0.006	0.010	0.014
Hispanic Share	0.05	0.016	0.050	0.082

(Financial variables in 2000 dollars)

LeSage and Pace (2009) motivate the use of the Spatial Durbin Model (SDM) through omitted variables. In standard spatial models, such as the spatial lag, the error term accounts for variables that may have been omitted. Those researchers argue that if omitted variables exhibit spatial dependence, then estimating a standard ordinary least squares (OLS) model will produce inefficient estimates. The authors developed the SDM model with cross-sectional data, but the model can be expanded within a panel data framework. The model is presented in (4):

$$y_{it} = \lambda \sum_{j=1}^{N} w_{ij} y_{jt} + x_{it}\beta + \sum_{j=1}^{N} w_{ij} x_{ijt}\theta + \mu_i + \nu_t + \varepsilon_{it} \quad (4)$$

The basic specification is extended to include spatially lagged independent variables ($w_{ij}x_{ijt}\theta$). The standard approach to estimating this model is to have the fixed effects removed by demeaning the dependent and independent variables[6]. The demeaned equation is estimated by maximum likelihood (Baltagi, 2008). Lee and Yu (2010) show that this method can produce inconsistent parameters, and the authors derived a procedure to correct this bias. Elhorst (2014) extends the bias correction procedure to the spatial lag model, the spatial error model, and the SDM.

4. Results

A spatial panel data model with spatial and time fixed effects, using the bias-correction procedure outlined by Lee and Yu (2010), is estimated. Table 5 provides the model estimates. While the choice of SDM was motivated by a discussion of omitted variables, Elhorst (2014) outlines a taxonomy of tests to determine whether the SDM is the proper model. In the table, the results of a series of Wald tests to determine whether the SDM can be simplified to a lag model or an error model are provided. Also provided are the results of a Hausman test to ascertain whether a random-effects model or a fixed-effects model is appropriate[7].

[6] The description is taken from Elhorst (2014), who described the estimation procedure for a fixed-effects spatial lag model. The SDM panel model is estimated similar to the X matrix replaced by [XWX].

[7] MATLAB codes and examples for these tests are available at Paul Elhorst's website (http://www.regroningen.nl/elhorst/).

Table 5. Spatial Durbin Panel Model parameter estimates.

Variable	Coefficient	t-stat	Coefficient	t-stat
Spatial Parameter (λ)	0.4493***	52.630	0.4493***	52.627
Polarization Index	-0.0208	-1.126		
Ethnic Fragmentation			-0.0555	-1.791
Elderly Share	-0.5286***	-2.854	-0.5496***	-2.968
Owner-occupied	0.0150	0.326	0.0163	0.354
Median Household Income	0.1298***	7.546	0.1297***	7.539
Youth Share	-0.8514***	-10.50	-0.8582***	-10.57
Urban Share	-0.0072	-1.046	-0.0077	-1.113
College-educated	0.0986***	2.821	0.0982***	2.816
Per-child Federal Aid	0.0129***	9.065	0.0130***	9.124
State Revenue Share	-0.0837***	-5.317	-0.0846***	-5.369
Reform (Equity)	0.0833***	3.498	0.0828***	3.474
Reform (Adequacy)	0.0286	1.528	0.0287	1.533
Reform (Lower)	0.0308	1.190	0.0303	1.172
Number of Households	-0.0183**	-2.453	-0.0182**	-2.435
Black Share	0.1713***	2.751	0.1927***	3.020
Native Share	0.4399***	2.806	0.4607***	2.928
Asian Share	-0.5782***	-4.044	-0.5351***	-3.679
Hispanic Share	0.0795	1.811	0.1037**	2.186
W-Polarization Index	-0.0698**	-2.401		
W-Ethnic Fragmentation			-0.0943**	-2.031
W-Elderly Share	0.2202	0.647	0.1039	0.305
W-Owner-occupied	0.1651	1.909	0.1839**	2.133
W-Median Household Income	-0.0231	-1.108	-0.0236	-1.130
W-Youth Share	-1.1717***	-8.511	-1.1853***	-8.622
W-Urban Share	0.0061	0.435	0.0040	0.284
W-College-educated	-0.1526***	-2.780	-0.1611***	-2.962
W-Per-child Federal Aid	-0.0107***	-4.218	-0.0103***	-4.072
W-State Revenue Share	0.0472**	2.296	0.0430**	2.087
W-Reform (Equity)	-0.0280	-1.105	-0.0279	-1.099
W-Reform (Adequacy)	-0.0155	-0.779	-0.0170	-0.855
W-Reform (Lower)	-0.0020	-0.070	-0.0017	-0.059
W-Number of Households	0.0467***	3.683	0.0490***	3.855
W-Black Share	0.1624	1.468	0.1505	1.348
W-Native Share	-1.1317***	-4.172	-1.1557***	-4.263
W-Asian Share	0.5623***	2.673	0.6301***	2.911
W-Hispanic Share	-0.1289**	-2.444	-0.1156**	-1.989
Wald test (spatial lag)	292.83***			
Wald test (spatial error)	343.23***			
Hausman test	226.90***			

**** Statistically significant at the 1% level; ** statistically significant at the 5% level.*

The spatial parameter is significant in showing the existence of spatial dependence with respect to per-pupil expenditures. The results of the specification tests show that the SDM with fixed effects is the correct model to estimate. Further inferences are not appropriate in this case, and proper scalar summaries need to be calculated because in spatial models the coefficient estimates are not equal to the partial derivatives. LeSage and Pace (2009) show that partial derivatives, instead of scalars, actually produce

matrix expressions. Averaging the diagonal elements and off-diagonal elements, those authors generate scalar summaries (of marginal effects) that can be used to make inferences. The diagonal elements are the average direct effects of the explanatory variables, while the off-diagonal elements are the average indirect effects. The average indirect effects can be interpreted as spatial spillovers of the explanatory variables to the outcome measure. The sum of the average direct and indirect effects constitute the average total effects. Tables 6 and 7 display the marginal effects, which show the spillover effects of ethnic heterogeneity.

Table 6. Marginal effects of Spatial Durbin Model (Fragmentation Index).

	Direct	Indirect	Total
Ethnic Fragmentation	-0.0664**	-0.2051***	-0.2715***
Elderly Share	-0.5663***	-0.2777	-0.8440
Owner-occupied	0.0355	0.3319**	0.3674**
Median Household Income	0.1327***	0.0587	0.1914***
Youth Share	-1.0100***	-2.7223***	-3.7323***
Urban Share	-0.0075	0.0011	-0.0064
College-educated	0.0872***	-0.1972**	-0.1100
Per-child Federal Aid	0.0125***	-0.0075	0.0050
State Revenue Share	-0.0834***	0.0081	-0.0753***
Reform (Equity)	0.0833***	0.0160	0.0993***
Reform (Adequacy)	0.0286	-0.0074	0.0211**
Reform (Lower)	0.0304	0.0221	0.0525***
Number of Households	-0.0140	0.0705***	0.0564***
Black Share	0.2143***	0.4183**	0.6326***
Native Share	0.3717**	-1.6357***	-1.2639***
Asian Share	-0.4995***	0.6567**	0.1573
Hispanic Share	0.0971**	-0.1171	-0.0200

**** Statistically significant at the 1% level; ** statistically significant at the 5% level.*

Table 7. Marginal effects of Spatial Durbin Model (Polarization Index).

	Direct	Indirect	Total
Polarization Index	-0.0281	-0.1355***	-0.1636***
Elderly Share	-0.5299***	-0.0305	-0.5604
Owner-occupied	0.0324	0.2887**	0.3211**
Median Household Income	0.1334***	0.0597	0.1931***
Youth Share	-0.9996***	-2.6796***	-3.6791***
Urban Share	-0.0073	0.0056	-0.0017
College-educated	0.0885***	-0.1896**	-0.1012
Per-child Federal Aid	0.0124***	-0.0083**	0.0041
State Revenue Share	-0.0823***	0.0164	-0.0660***
Reform (Equity)	0.0853***	0.0154	0.1007***
Reform (Adequacy)	0.0277	-0.0036	0.0242**
Reform (Lower)	0.0334	0.0201	0.0535***
Number of Households	-0.0143**	0.0667***	0.0523**
Black Share	0.1942***	0.4155**	0.6097***
Native Share	0.3500**	-1.5804***	-1.2304***
Asian Share	-0.5460***	0.5295	-0.0165
Hispanic Share	0.0696	-0.1629**	-0.0932

**** Statistically significant at the 1% level; ** statistically significant at the 5% level.*

The average direct effects are similar to the coefficient estimates from an OLS model[8]. These effects are consistent with the predictions from previous research for the demand for public goods. School districts with higher median incomes, more college-educated individuals, higher federal aid, and in states with equity-based court-ordered reform have higher levels of spending. School districts with more elderly, more youth, higher levels of state revenue share, and a larger number of households have lower levels of spending. School districts with a larger share of African Americans and Native Americans[9] have higher levels of spending, while school districts with a larger share of Asians have lower levels of spending. Tedin et al. (2001) found that each ethnic group has similar preferences for education, although Blacks and Hispanics show more support.

The spillover effects, measured by the average indirect effects, indicate that school districts with greater ethnic heterogeneity, more youth, more college-educated individuals, and more Native Americans tend to have neighboring school districts with lower levels of per-pupil spending. School districts with more households tend to have neighboring school districts with higher levels of spending. Housing price capitalization can cause spillover effects because residents migrate to districts with higher perceived school quality[10]. Cebula and Alexander (2006) show that higher state-level spending on education attracts residents. This mobility drives the spillover effects because the movement of households changes the tax base for each school district.

5. Discussion

The findings of this study show that increased ethnic fragmentation negatively affects school district expenditures, which is consistent with the literature. However, the polarization index is not significantly related to per-pupil spending. The explanation of this result is that conflict over resource allocation does not drive lower spending, but there is more spending that occurs in homogenous communities. This corresponds to the analysis using GSS data, indicating that increased ethnic heterogeneity can lead to either more support or less support for education. Scholars hypothesize that ethnic heterogeneity should negatively affect support for public education[11]. Alesina and La Ferrara (2005) develop a model showing that public goods provision decreases when ethnic heterogeneity increases because of the difficulty of building consensus. The authors argue that the heterogeneity of preferences among racial and ethnic groups can lower total spending on public goods. A similar argument proposed by Luttmer (2001) is that individuals' preferences for redistribution depend on more than their personal characteristics; their preferences are influenced by those around them. In the case of certain types of public goods, namely welfare, there is a negative exposure effect which increases in the racial composition of the neighborhood and leads to lower support for welfare. Thus, changes in racial composition translate into differences in the level of redistribution across regions. Dahlberg et al. (2012) find that greater ethnic diversity lowers support for redistribution, especially among those earning high incomes. These findings are driven by in-group preferences for public goods that would benefit that group or by the lack of desire to support public goods that benefit out-groups (Habyarimana et al., 2008; Lind, 2007). These studies explain why increased ethnic heterogeneity leads to lower per-pupil expenditures.

However, these studies do not explain the spillover effect with ethnic heterogeneity. The fact that ethnic heterogeneity, measured by both the fragmentation index and the polarization index, negatively affects neighboring per-pupil expenditures can help us to understand the spillover effect. Polarization implies conflict in resource allocation, which moves beyond the argument that consensus building is difficult with a heterogeneous population. Alesina and La Ferrara (2002) find that trust is lower in racially heterogeneous regions. Lower levels of trust are correlated to lower levels of social capital (Putnam, 1995; Costa and Kahn, 2000). In communities with low levels of social capital, residents will not support public goods, such as education or welfare, especially if they believe that the spending goes to ethnic groups other than their own. This hypothesis, posited by Cutler, Elmendorf, and Zeckhauser (1993), implies that discriminatory preferences exist

[8] The estimates are not directly comparable because the average direct effects incorporate the feedback effects that arise from the effect of a change in the explanatory variable on the dependent variable while investigating the impact on neighboring regions.

[9] There are special federal grants programs to support education for Native Americans.

[10] The literature on actual school quality is mixed (Black and Machin, 2011; Haurin, Dietz, and Weinberg, 2003).

[11] It is not always the case that more heterogeneity leads to lower public goods spending. Boustan et al. (2013) find that higher levels of income inequality lead to higher levels of education spending.

and that residents would vote for lower spending on education because they would not experience the benefits themselves.

6. Conclusions

This paper investigated the relationship between ethnic heterogeneity and school district expenditures, accounting for the potential spillover effect of other school district characteristics. The estimation of the spillover effects was through a Spatial Durbin Model over a three-year panel of U.S. school districts. The findings provided in this study support the hypothesis that greater ethnic heterogeneity leads to lower education spending, as has been found in the literature (Ajilore, 2011; Alesina and La Ferrara, 2002; Poterba, 1997). Further results show that greater ethnic heterogeneity has negative spillover effects on education spending. The demographic structure of communities in the United States has become more ethnically diverse and will continue to become more diverse; therefore, we can expect lower support for education spending.

A problem with this negative relationship between ethnic heterogeneity and education spending is that education spending is a factor in the positive net migration of residents at the state level (Cebula and Alexander, 2006; Cebula and Nair-Rechert, 2012). If increasing diversity lowers education spending, this will have negative effects for the tax base. A potential mitigating factor is the role of economic freedom, as states with greater economic freedom see greater in-migration of residents (Ashby, 2007). Greater economic freedom could minimize the degree to which internal migration occurs from increases in ethnic heterogeneity. Mulholland and Hernandez-Julian (2013) found that states with greater economic freedom attract those with college education, which in this study is positively related to education spending. Future research may analyze interaction effects between state-level economic freedom and ethnic heterogeneity using hierarchical linear models. Lacombe and McIntyre (2016) have developed spatial hierarchical linear models that can be applied in this scenario.

While both increases in ethnic heterogeneity and increases in neighboring ethnic heterogeneity lower per-pupil expenditures, there are positive takeaways from the results. Following the social capital hypothesis, if trust can be established among different ethnic groups within a given school district, we may see more support for education spending. Stolle et al. (2008) show that with increased social interactions, greater ethnic diversity does not lead to lower levels of trust. Unlike polarization, which shows that greater ethnic heterogeneity leads to greater conflict, more fragmentation does not necessarily mean less education spending. Policies to improve social capital and trust should be on the agendas of state and local policymakers everywhere.

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