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The Migration of High School Graduates to College

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The National Center for Education Statistics reports that over 250,000 high school graduates moved across state lines to enroll in college in 2008. The choices made by these high ability individuals may have long-lasting implications for state economies; not only do they contribute to state and local economies through their tuition and daily living costs while studying, but many of them will be retained in the workforce in the state in which they graduate. This paper argues that inadequate attention has been paid to the spatial processes that underpin such migrations. Specifically, models are required that simultaneously consider the characteristics of both migration origins and destinations and their relative spatial arrangements. Thus, the purpose of this research is to present an alternative, explicitly spatial, approach to modeling the migration of high school graduates to college. Our results provide new insights into the factors that determine such flows and have direct relevance to policy-making in this sphere.

Keywords: *migration, college enrollment*

THE geographic concentration of highly skilled workers is an important determinant of regional economic growth (Storper & Scott, 2009). However, the factors that attract skilled workers into certain areas are relatively underresearched (Hansen & Niedomysl, 2009). Particularly important are the flows of students to college; the National Center for Education Statistics (2009) reported that over 250,000 high school graduates moved across state lines to enroll in college in 2008. The choices made by these high-ability individuals may have long-lasting implications for state economies; not only do they contribute to state and local economies through their tuition and daily living costs while studying, but at least some them will be retained in the workforce in the states in which they graduate (Groen, 2004; Parsad & Gray, 2005).

Previous research on student migration has generally focused on either in-migration (the percentage nonresident enrollment at a university) or out-migration (the percentage of a state's high school graduates attending school in another state). These studies have found that the out-migration of students is positively related to public university tuition and negatively related to the quality of both public and private universities, the number of enrollment opportunities, and the availability of a broad-based public university merit scholarship program (see Mak & Moncur, 2003; Orsuwan & Heck, 2009; Zhang & Ness, 2010), while the in-migration of students is positively related to the quality of the university and the size of the university and negatively related to tuition (see Adkisson & Peach, 2008). Results regarding the effect of tuition on nonresident enrollment are mixed, with strong evidence that elite national universities enjoy a high degree of pricing power, so that for them, nonresident enrollment is positively related to tuition (Baryla & Dotterweich, 2001, 2006; Dotterweich & Baryla, 2005).

However, the movement of students from one state to another state is a joint function of both the characteristics of the state of origin and potential destination states. Models that focus on just out-migration or in-migration cannot fully capture how the joint characteristics of origins and destinations influence migration behavior. For example, a model of out-migration rates can include only the characteristics of the origin state and cannot include those of the chosen destination state, even though those destination-specific characteristics clearly have an influence on out-migration. A parallel argument can be made for in-migration. Thus, models of in- and out-migration rates may not be correctly specified, because they exclude important determinants of the migration decision. The purpose of this research is to introduce to the student migration literature a well-established technique used in migration research that addresses this issue. Our results provide new insights into the factors that determine student migration behavior and have direct relevance to policy making in this sphere.

Background

The decision to attend college is clearly spatial; student enrollment choices are inevitably based to some degree on the spatial distribution of enrollment opportunities relative to their place of high school residence. Students who live in close proximity to a diverse range of enrollment opportunities are more likely to apply to college and to attend colleges closer to home, while students who live in areas with few enrollment opportunities are less likely to apply to college and more likely to attend colleges far from home (Frenette, 2006; Leppel, 1993; Lopez Turley, 2009; Mulder & Clark, 2002; Sa, Florax, & Rietveld, 2006). Thus, the out-migration of students from a state is not just a function of the state's characteristics but is also influenced by the opportunities in every other state and their spatial arrangement relative to the origin state. The same can be said for the in-migration of students into colleges within states.

The importance of considering simultaneously how the characteristics of origins, destinations, and their relative spatial arrangement influence migrant flows is well established in the geography literature. Failure to incorporate these factors into migration models may introduce specification bias and likely ignores significant factors that ultimately determine net migration patterns (Rogers, 1990). To resolve these issues, geographers have developed spatial interaction models, a special case of which is the seminal gravity model formulation (Stewart, 1948; Stouffer, 1940, 1960; Zipf, 1949), from which the determinants of out-, in-, and net migration patterns can be appropriately identified (Haynes & Fotheringham, 1984; Wilson, 1971). The spatial interaction framework conceptualizes the gross volume of migration, M, between an origin (i) and a destination (j) as a function of the attributes of the origin, O, the attributes of the destination, D, and attributes describing the spatial arrangement of origins and destinations, S:

$$M_{ij} = f(O_i, D_j, S_{ij}).$$

So, for example, the dependent variable in a spatial interaction model of migration between each of the 50 states would be each of the 2,450 observed intrastate migration flows ($50^2 - 50$ or $n^2 - n$ possible flows after excluding intrastate migration flows). As the flows are counts of migrants, and there will be many zero, several low, and few high values, a Poisson regression model is an appropriate functional form for a spatial interaction model (Congdon, 1991, 1993; Flowerdew, 1991; Flowerdew & Aitkin, 1982).

Although any number of independent variables can be incorporated into a spatial interaction model, the key variables relating to a traditional gravity model specification would include an origin variable reflecting the size of the population at risk for migrating, a destination variable reflecting the number of opportunities available to migrants, and the distance between each origin and the destination. Commonly, a second spatial variable would also be used to reflect the spatial structure of the various origins and destinations, such as Stouffer's (1940, 1960) intervening opportunities variable, whereby the amount of migration between an origin and a destination will be reduced by the degree to which there are alternative, intervening migration destinations that lie between the two. Failure to include a spatial structure variable such as this may subject the analysis to both specification and autocorrelation bias.

Although nearly all models of student migration have incorporated some sort of variable that measures spatial opportunities surrounding an origin for models of out-migration, or a destination for models of in-migration, very few studies have modeled migration flows from origins to destinations within a spatial interaction approach. Slater (1976) created migration regions from a matrix of student migration flows, Johns & Viehland (1989) described the visual patterns observed in a matrix of student migration flows, and Abbott and Schmid (1975), Fryman (1988), and Kyung (1996) observed a negative effect of distance on interstate student migration. More substantively, Alm and Winters (2009) estimated models of intrastate student migration flows between Georgia's counties and institutions of higher education and found that distance mediates the effects of the other independent variables. Sa, Florax, and Rietveld (2004) reached a similar conclusion in models of student migration flows in the Netherlands.

These studies notwithstanding, McHugh and Morgan (1984) performed the only study to have estimated models of the flows between the 48 contiguous U.S. states for a sample of students enrolled in public universities. They found that the size of the migration flow increased with the number of students in the origin state, the per capita income in the origin and the destination, and private college costs of attendance in the origin, and decreased with measures of educational quality in the destination. With respect to spatial factors, the size of migration flows declined with the distance between the origin and destination and increased with the average distance of the origin state from all other states. The analysis indicates that both origin- and destination-specific characteristics as well as their spatial arrangement jointly, but not necessarily symmetrically, influence college-bound students' decisions. However, the study was limited by the fact that it was restricted only to public university students, and the results were not interpreted with respect to the net gain or loss of college students by state. Finally, the specification of the "intervening opportunities" variable (the average distance of all states from the origin state) was not defined consistently with the variables commonly used in the migration literature, and its positive value is counterintuitive: The expected flow between any two randomly selected states should be lower, rather than higher, if there are many opportunities between the two states.

The spatial interaction perspective models migration flows between a set of origins and destinations as a function of the characteristics of the origins, the destinations, and their relative spatial arrangement. Models that focus on just out-migration or in-migration cannot fully capture how the joint characteristics of origins and destinations, and their spatial arrangement, influence migration behavior and may be improperly specified. The purpose of this research is to introduce this approach to the student migration literature through the estimation of a spatial interaction model of the interstate migration of high school students to college.

Data and Methods

The primary source of data is the 2007 Integrated Postsecondary Education Data System provided by the U.S. Department of Education's National Center for Education Statistics, which reports annual data on enrollments, program completions, graduation rates, faculty and staff, finances, institutional prices, and student financial aid for all institutions that participate in federal student aid programs (National Center for Education Statistics, 2009). The analysis uses data from the 2006–2007 academic year and focuses on public and private colleges and universities that offer accredited bachelor's degrees in a primarily traditional residential setting.[1] Importantly, these data report, for each institution, the number of students by state when they applied to college. It is from these data that gross interstate migration flows are calculated.

The analysis is limited to 47 states and the District of Columbia (which for simplicity is treated and referred to as a state throughout the analysis). Hawaii and Alaska are not included because their separation from the contiguous United States would introduce modeling issues that would not appreciably contribute to the overall quality of the model because of the small amount of migration to and from those two states. Wyoming is also deleted, because the model specification requires independent variables on the characteristics of each state's private universities. However, Wyoming is a small state with only one large public university and no private universities.

The resulting sample of 2,256 observations represents the number of college-bound students migrating from each of the 48 selected states to every other state ($48^2 - 48$ interstate migration flows after

TABLE 1
Variable Definitions

Variable	Definition
Spatial variables	
Distance between origin and destination	Distance between origin and destination states (logged)
Adjacency	1 if states are adjacent, 0 if not
Intervening opportunities	See text
Geographic variables	
High school graduates, origin	Number of in-sample college-bound high school graduates (logged)
High school graduates, destination	Number of in-sample college-bound high school graduates (logged)
Change in unemployment, origin	Change in unemployment rate from 2006 to 2007
Change in unemployment, destination	Change in unemployment rate from 2006 to 2007
Per capita income, origin	2006 per capita income (logged)
Per capita income, destination	2006 per capita income (logged)
Amenities, origin	A measure of the quality of natural amenities based on topography and climatic conditions (Peters, 2000
Amenities, destination	A measure of the quality of natural amenities based on topography and climatic conditions (Peters, 2000)
% Urban, origin	Percentage of the state population living in urban areas
% Urban, destination	Percentage of the state population living in urban areas
% Population 18–24, origin	Percentage of the state population between the ages of 18 and 24 years
% Population 18–24, destination	Percentage of the state population between the ages of 18 and 24 years
Public university variables	
Public enrollment, origin	Full-time equivalent in-sample enrollment (logged)
Public enrollment, destination	Full-time equivalent in-sample enrollment (logged)
Public ACT 75th percentile, origin	Enrollment-weighted average 75th-percentile score on the ACT
Public ACT 75th percentile, destination	Enrollment-weighted average 75th-percentile score on the ACT
Public cost of enrollment, origin	Enrollment-weighted average in-state public cost of attendance (logged)
Public cost of enrollment, destination	Enrollment-weighted out-of-state public tuition cost of attendance (logged)
Public admissions rate, origin	Enrollment-weighted university admissions rate
Public admissions rate, destination	Enrollment-weighted university admissions rate
Merit scholarship program, origin	Presence of a broad-based merit scholarship program (1 = yes, 0 = no) (Orsuwan & Heck, 2009)
Merit scholarship program, destination	Presence of a broad-based merit scholarship program (1 = yes, 0 = no) (Orsuwan & Heck, 2009)
Private university variables	
Private enrollment, origin	Full-time equivalent in-sample enrollment (logged)
Private enrollment, destination	Full-time equivalent in-sample enrollment (logged)
Private ACT 75th percentile, origin	Enrollment-weighted average 75th-percentile score on the ACT
Private ACT 75th percentile, destination	Enrollment-weighted average 75th-percentile score on the ACT
Private cost of enrollment, origin	Enrollment-weighted average cost of attendance (logged)
Private cost of enrollment, destination	Enrollment-weighted average cost of attendance (logged)
Private admissions rate, origin	Enrollment-weighted university admissions rate
Private admissions rate, destination	Enrollment-weighted university admissions rate

deleting intrastate moves). These gross migration flows represent the number of students moving from their states of residence (defined as their states of residence when they applied to college in the spring of 2006) to their states of college matriculation in the fall of 2006. These flows are then estimated in a Poisson regression framework as a function of four broad sets of variables (see Table 1).

The first set of independent variables measure the effect of the spatial arrangement of origins and destinations on gross migration flows between states. Distance is included because one of the most consistent findings in the migration literature is that flows generally decline with distance, reflecting the cost of migration, the quality of information, and, for students, the separation from friends and family (Frenette, 2006; Leppel, 1993; Lopez Turley, 2009; Mulder & Clark, 2002; Sa et al., 2006). In this case, distance between states is measured by calculating the spherical distance between the population-weighted geographic centroids of each state (U.S. Census Bureau, 2009).[2] However, Euclidean distance is a crude measure, especially for contiguous states. These may be poorly estimated because the distance calculated between contiguous zones is commonly an overestimate of the average distance moved between such places. Consequently, a dummy variable is often used to identify those pairs of places that are adjacent (Zhang & Ness, 2010), and in this case, a dummy variable is included reflecting whether a pair of states are adjacent to each other. This may also capture regional agreements that encourage students to attend universities in neighboring states (see Zhang & Ness, 2010). Additionally, migration from the origin to the destination is likely affected by intervening opportunities: We expect that migration from one state to another will be reduced if the origin state is closely surrounded by a large number of higher education opportunities, and likewise, migration from one state to another will increase if the origin state is located in an area with very few nearby higher education opportunities. The variable is defined as

$$\ln\left[\sum_{i,j\neq i}\left(\frac{\text{FTE}_j}{\log(d_{ij})}\right)\right],$$

where FTEj is the in-sample full-time enrollment in both public and private universities at the destination, and d_{ij} is the distance from state i to state j.

The second set of independent variables reflects the geographic characteristics of each state. College students migrate as single individuals with low costs of living and a lifetime to recoup the cost of the migration decision (Perna, 2006). Thus, they are likely to be drawn to high-amenity destinations, like many other young populations with more expendable income (Black, Gates, Sanders, & Taylor, 2000; Chen & Rosenthal, 2008; Plane, Henrie, & Perry, 2005; Whisler, Waldorf, Mulligan, & Plane, 2008). Variables such as natural amenities in the origin and destination, the age characteristics of the population in the origin and destination, urbanization in the origin and destination, income levels in the origin and destination, and the number of potential migrants in the origin and destination are therefore included.

The third and fourth sets of independent variables are included to measure the effects of public and private university characteristics on migration flows. The decision to migrate to college is also a human capital investment (Parsad & Gray, 2005; Sjaastad, 1962). Quite literally, students are making an investment in time and money with the direct goal of increasing their lifetime utility and, probably, their lifetime earnings. Thus, the quality of the enrollment opportunities relative to the cost of those opportunities is also a factor in the migration decision. These factors are measured by variables indicating enrollment in the origin and destination, admissions rates in the origin and destination, total cost of attendance in the origin and destination,[3] the presence of a merit scholarship program in the origin and destination, and measures of university quality in the origin and destination.

The model parameters give clear indications as to how specific variables affect the flow of students from origins to destinations. However, interpreting the parameters of the model is not clear cut, because many of the key variables are log transformed, and the model itself is not linear. A more insightful, alternative approach is to make predictions with respect to these key variables. First, the combined impact of the spatial variables on state net migration is made by predicting every migration flow while holding the spatial variables at their sample means. These predicted flows are then summed by origins and destinations to calculate the net migration rate

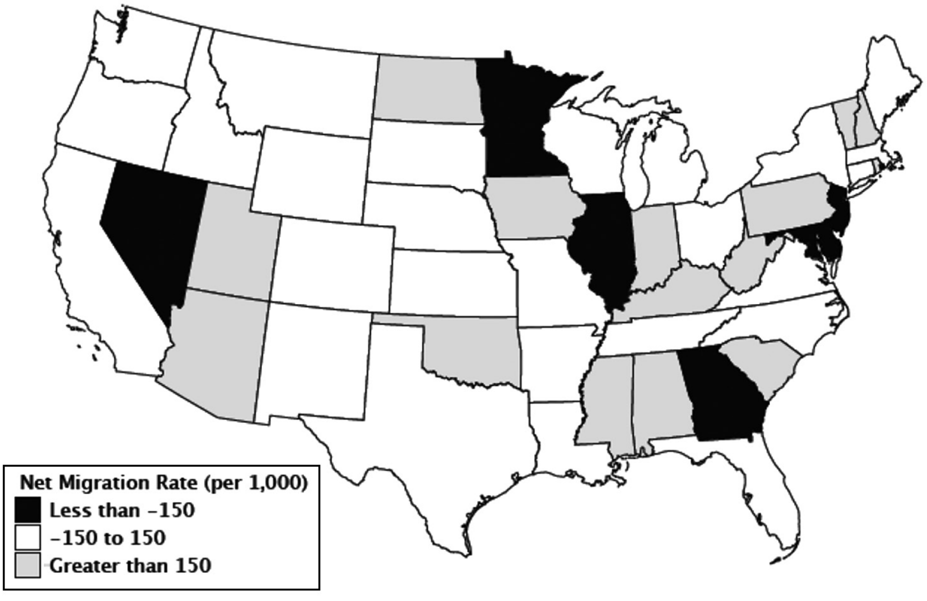

FIGURE 1. *Net migration of college-bound high school graduates.*

for each state while holding these spatial variables constant. The difference in this value with the predicted net migration rate is a measure of the impact of spatial structure on net migration rates. Similarly, the effect of implementing policy changes to improve net migration rates by lowering resident and nonresident costs of attendance and establishing a broad-based merit scholarship program is calculated in the same way.

Results

As described above, the ultimate aim of this analysis is to gain a better understanding of net migration, and Figure 1 shows the observed patterns. First, the states with the largest negative net migration are either small, densely settled states of the East Coast (Maryland, Delaware, and New Jersey) or large, generally populous states (Minnesota, Illinois, and Georgia), Nevada being the exception, although it is similar to this last group in terms of size. The second pattern relates to the first, as the states with the largest positive net migration are generally adjacent, or proximate, to the previous set of negative net migration states (e.g., Iowa, Indiana, South Carolina, Alabama, Utah, Pennsylvania, and West Virginia). These states are also less densely settled and/or more rural than the negative net migration states. In these cases, the spatial proximity to large numbers of high school graduates may provide their colleges with an advantage in attracting out-of-state students.

Table 2 reports the model estimates along with the likelihood ratio test and the Wald test for the inclusion of the three spatial variables. These tests are all highly significant, indicating that the spatial variables make a significant contribution to the estimation of the migration of students between states. Clearly, a spatial perspective improves the explanation of the interstate migration of college-bound high school graduates, and the first set of parameter estimates demonstrate that migration flows decrease with the distance between the origin and destination, increase if states are adjacent to one another, and increase (decrease) if the origin is surrounded by states with few (many) higher education opportunities. These are not surprising results, but their significance is important to emphasize, as previous research on student migration has neglected to include them.

This point is emphasized in Figure 2, which shows the contribution of each state's spatial

TABLE 2
Parameter Estimates

Variable	Parameter	*p*
Spatial variables		
Distance between origin and destination	–1.040	.000
States are adjacent	0.807	.000
Intervening opportunities	–8.475	.000
Geographic variables		
High school graduates, origin	0.023	.098
High school graduates, destination	0.073	.000
Change in unemployment, origin	0.130	.000
Change in unemployment, destination	–0.144	.000
Per capita income, origin	2.871	.000
Per capita income, destination	–0.387	.000
Amenities, origin	–0.154	.000
Amenities, destination	0.164	.000
% Urban, origin	0.004	.000
% Urban, destination	–0.027	.000
% Population 18–24, origin	–0.262	.000
% Population 18–24, destination	0.169	.000
Public university variables		
Public enrollment, origin	0.630	.000
Public enrollment, destination	0.250	.000
Public ACT 75th percentile, origin	0.055	.000
Public ACT 75th percentile, destination	0.113	.000
Public tuition, origin	1.199	.000
Public tuition, destination	–0.111	.000
Public cost of enrollment, origin	0.001	.040
Public cost of enrollment, destination	0.003	.000
Merit scholarship program, origin	–0.132	.000
Merit scholarship program, destination	–0.011	.155
Private university variables		
Private enrollment, origin	–0.108	.000
Private enrollment, destination	0.447	.000
Private ACT 75th percentile, origin	0.066	.000
Private ACT 75th percentile, destination	0.027	.000
Private cost of enrollment, origin	–0.359	.000
Private cost of enrollment, destination	0.659	.000
Private admissions rate, origin	–0.017	.000
Private admissions rate, destination	0.020	.000
Constant	–30.557	.000
Test of model fit		
Pseudo-R^2	.8310	.000
Tests of adding spatial variables		
Wald test	280,000	.000
Likelihood ratio test	264,512	.000

variables to its overall net migration rate. Positive values indicate that the combined effect of the spatial variables (distance, intervening opportunities, and adjacency) act to improve the net migration of a state, while negative values indicate that spatial structure acts to harm the net migration of a state. Thus, the large negative value for New Jersey indicates that it is harmed by its relative spatial location. In this case, New Jersey high school graduates are in close proximity to out-of-state enrollment opportunities as measured by distance, adjacency, and intervening opportunities, all of which increases out-migration. Second, residents in adjacent states also have many nearby out-of-state opportunities other than New Jersey that decrease in-migration to New Jersey. Finally,

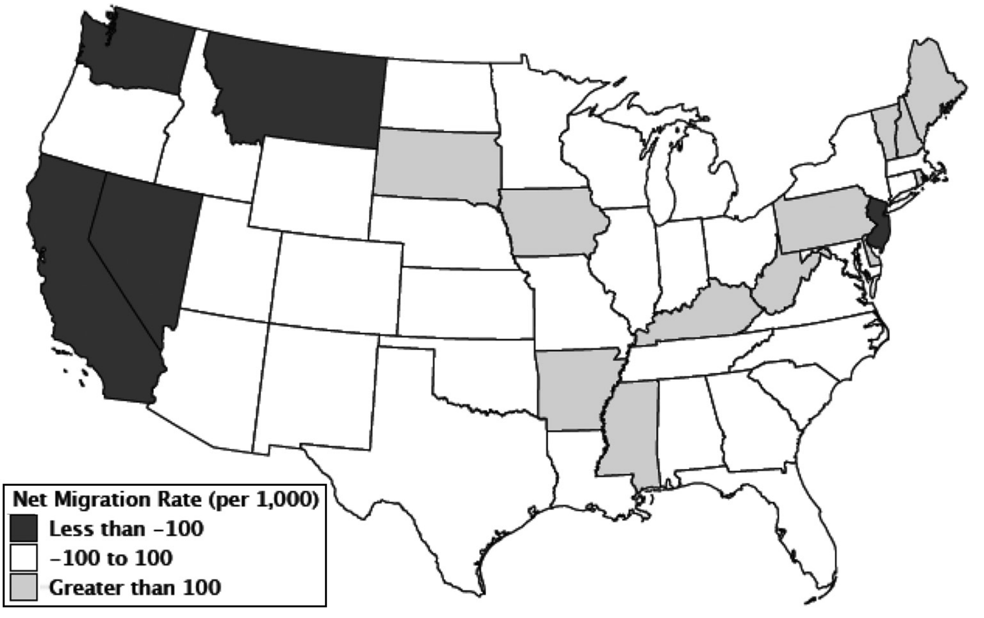

FIGURE 2. *Spatial effects on net migration rate.*

not only is New Jersey far from potential in-migrants because of its position on the East Coast, but it is in the center of the country's greatest concentration of enrollment opportunities, and hence, from the perspective of students in other states, there are many other intervening opportunities between any potential origin state and New Jersey. Although these likely affect all East Coast states, this combination of spatial factors is most difficult for New Jersey.

In contrast, the large negative effect of spatial structure on net migration on the western states of Montana, Washington, Nevada, and California is due to a different set of circumstances. Montana, Washington, and California are spatially isolated by distance and intervening opportunities from potential high school students and surrounded by less populous states. Nevada appears to be an anomaly, but in fact the location of its two major universities in Reno and Las Vegas effectively puts the center of the state's higher education sector on the border with California, meaning that it suffers from the same sort of spatial issues as Montana, Washington, and California. With respect to those states in Figure 2 with a positive spatial effect, almost without exception these are less densely settled, more rural states surrounded by more densely settled, more urban states. As a result, they benefit from their spatial proximity to a large number of potential in-migrants relative to the small number of potential out-migrants within their borders.

The second set of parameter estimates in Table 2 relates to the geographic characteristics of states as origins and destinations. One way to interpret these results is in terms of the direction of migration flows. For example, the parameter for the number of high school graduates in the origin is 0.023, while the parameter for the number of high school graduates in the destination is 0.073. This implies that the number of high school graduates has a greater positive effect on in-migration than on out-migration. Thus, student migration flows are inefficient in the sense that states with many high school graduates experience positive net migration as a result. This may be due to multicollinearity with population size or even the spatial variables, but alternative model specifications including the population of each origin state did not alter these results.

The other geographic variables are more directly interpreted and consistent with expectations regarding a young, upwardly mobile population: Student migration flows from states with increasing unemployment toward states with decreasing unemployment, from states with higher incomes toward states with lower incomes, from states with fewer natural amenities toward states with more natural amenities, from highly urbanized states to less urbanized states, and from states with low proportions of 18- to 24-year-olds to states with high proportions of 18- to 24-year-olds.

With respect to the characteristics of public universities, the enrollment parameters indicate the same sort of inefficiency as with the high school graduate parameters: The parameter for public enrollment in the origin is 0.630, while the parameter for public enrollment in the destination is 0.250. This implies that states with large public enrollments have net out-migration of students. This too may be a spurious correlation with population size, but alternative model specifications including the population of each origin state did not alter these results. The other public university variables behave more to expectations: Student migration flows toward states with higher quality public universities (as measured by standardized test scores), from states with higher in-state costs of attendance toward states with lower out-of-state costs of attendance, and toward states with higher admissions rates. The parameters associated with the presence of merit scholarship programs only indicate that they reduce out-migration and have no effect on in-migration. This is expected because merit scholarships are not available to out-of-state students.

Finally, the private university parameters indicate that student migration flows from states with lower private enrollment toward states with higher private enrollment, from states with higher quality private universities toward states with higher private costs of attendance, and from states with lower private admissions rates toward states with higher private admissions rates. These results confirm Dotterweich and Baryla's (2005) conclusion that "it appears that the very selective, expensive, private [institutions of higher education] are perceived differently by non-resident students and may have a special cache in the education marketplace" (p. 381).

The effect of the size of the public higher education sector notwithstanding and within the limitations of a cross-sectional analysis, the policy prescriptions are quite clear. Out-migration can be reduced by developing a merit scholarship program and lowering in-state costs of attendance, while in-migration can be increased by improving quality (as measured by standardized test scores), reducing out-of-state costs of attendance, and increasing admissions rates. The impact of these policy prescriptions is evaluated in the same manner that the spatial effects were estimated. However, lowering admissions rates and raising standardized tests scores are not directly achieved and have to be addressed within the context of a host of other changes at each university, most notably a likely increase in enrollment. Therefore, this exercise focuses on the two most easily implemented of these policies: decreasing both in-state and out-of-state public tuition and the adoption of in-state merit scholarship programs.

The effects of implementing such policies are estimated on a sample of six states, all of which have large negative net migration rates and none of which have merit scholarship programs (Orsuwan & Heck, 2009): Connecticut, Delaware, Illinois, Maryland, Minnesota, and New Jersey. For reference, total costs of enrollment range from a low of $17,798 for resident students and $25,326 for nonresident students in Minnesota to a high of $23,263 for resident students and $30,732 for nonresident students in New Jersey. Figure 3 shows that all of the states would benefit from reductions in nonresident and resident costs of enrollment. Most prominently, New Jersey, with a net migration rate of –369 per 1,000 and with the highest resident and nonresident costs of enrollment of the six states, would see an increase in net migration to –248 per 1,000 with a 20% drop in costs of attendance. The other five states would see relatively similar improvements in net migration. Indeed, Maryland could nearly eliminate its predicted net migration of –244 per 1,000 to –43 per 1,000 by reducing costs of attendance by 20%. The effects of establishing a broad-based merit scholarship program such as that implemented in Georgia are less meaningful. Indeed, the largest effect is for Delaware, which would see its predicted net migration fall from –452 per 1,000 to –391 per 1,000. Thus, student migration is not completely determined by spatial and geographic differences between places but is also responsive to policy prescriptions.

Discussion

This analysis makes several contributions to the study of the migration of high school students to college. First, this analysis introduced a spatial interaction approach, based on migration theory,

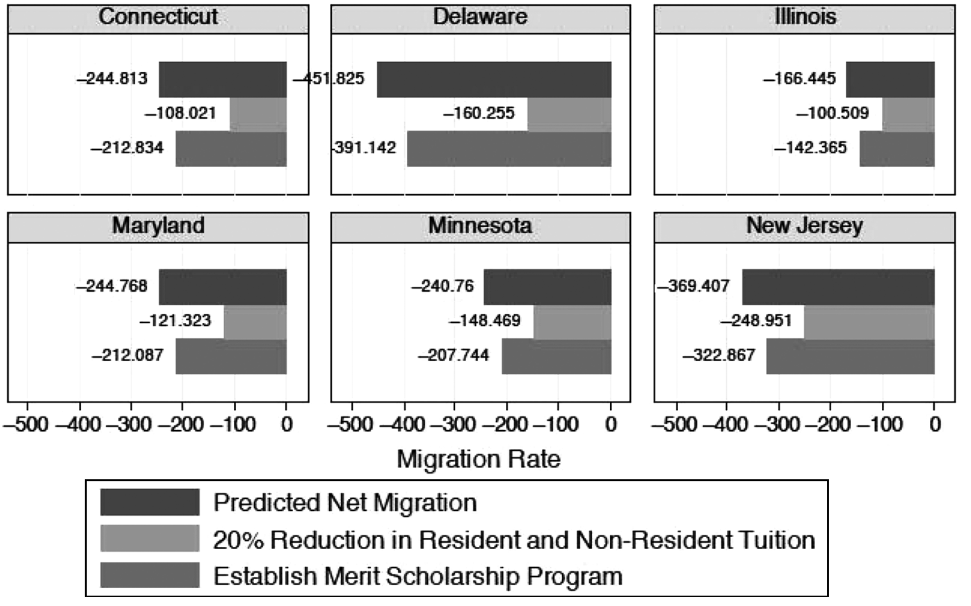

FIGURE 3. *Effects of policy variables.*

to the student migration literature. Although many previous studies have included regional variables and some spatial variables such as distance, this is the first to explicitly model the interstate migration of high school graduates to college within the spatial interaction framework. Our results are broadly consistent with previous findings: States with higher quality, competitively priced public universities and with higher priced public universities have a positive net flow of college freshmen. Students also are attracted toward more rural, high-amenity states with younger populations. However, the spatial perspective demonstrates the importance of the unequal distribution and arrangement of both high school students and colleges across the United States. For example, even though New Jersey is in the population center of the country, its position relative to surrounding states and on the edge of the continent places a severe structural impediment to achieving a positive flow of students into that state. On a more positive note, many less densely settled states proximate to larger, more densely settled states, especially in the eastern half of the United States, experience a positive externality in the form of increased net migration because of their spatial location alone.

We have also shown that the net flow of college students could be responsive to policy intervention: The model estimates indicate that net student migration can be improved by lowering in-state costs of attendance, improving quality (as measured by standardized test scores), reducing out-of-state costs of attendance, and increasing admissions rates. And indeed, simulations of the impact of a change in costs of attendance and establishing a broad-based merit scholarship program significantly improve net migration among a set of states that currently experience net out-migration, even for those such as New Jersey that are at a distinct spatial disadvantage. However, this analysis does not take the cost of these programs into account and additional analyses are needed to more precisely estimate the specific impacts of specific policy changes on student migration flows and the costs of those policies. In particular, future research should address the endogeneity between migration flows and many of the independent variables (e.g., tuition) through the use of panel rather than cross-sectional data and more precisely measure the role of proximity between states in shaping interstate migration by incorporating the effect of interstate reciprocity agreements.

Notes

1. The full list of selected institutions is available from the authors. The selection criteria exclude

institutions that (a) are not 4-year colleges, (b) are not degree-granting institutions, (c) do not offer bachelor's degrees, (d) are primarily associate's degree–granting institutions that also offer bachelor's degrees, (e) are primarily or exclusively graduate level, (f) are primarily or exclusively associate level, (g) are tribal colleges, and (h) are for profit.

2. Spherical distances were calculated using the SPHDIST Stata Module (Rising, 1999).

3. The University of the District of Columbia is the only public university in the district, but the cost of attendance data were not reported in this data set. The cost was estimated from the College Board (2009).

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