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**SPATIAL, CULTURAL, AND ECONOMIC DIMENSIONS OF ACCESS
TO AN URBAN PUBLIC COMPREHENSIVE UNIVERSITY**

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ABSTRACT

The accessibility of higher education in the U.S. is a pressing concern in light of shifting economic and demographic circumstances and more specifically because of the proximity constraints of urban students. Urban universities are well positioned to respond to these concerns. These institutions are defined by much more than their location in an urban setting; they have a responsibility to make education accessible to the diverse and sometimes economically disadvantaged students who reside in the surrounding areas. Student access to higher education has at least three interdependent dimensions: cultural, economic, and spatial. The present study investigated the interaction of these dimensions in a U.S. metropolitan area surrounding an urban public comprehensive university. Results indicated that distance from the university and income level of students' residence areas are predictive of enrollment rates; however, the model is less predictive for the enrollment rates of ethnic minorities.

SPATIAL, CULTURAL, AND ECONOMIC DIMENSIONS OF ACCESS TO AN URBAN PUBLIC COMPREHENSIVE UNIVERSITY

Higher education is essential for the advancement of nations and the individual. In order to participate effectively in the global economy, nations must become decentralized, customer- and information-oriented. Success in the world market depends on the availability of a pool of educated people who are trained in critical thinking, strategic planning, technological literacy, and adaptability to change. Higher education and opportunities for life-long learning are essential to preparing a capable work force (Naisbitt & Aburdene, 1990). For the individual, higher education is the key to acquiring the advanced skills and adaptability required for advancement in socio-economic status (Elliot, 1994).

Shifts in demography and the diversity of today's college students provide a challenge for higher education. According to Elliot (1994),

“With a shrinking pool of traditional Caucasian college-age students, greater numbers of young Hispanic and African Americans, and an influx of older people returning to school, future urban campuses are likely to make the diversity of today's urban campuses, pale in comparison” (p. 13).

Given these changes, potential college students, especially in urban areas, differ on many dimensions from what would be considered traditional college students. In comparison to traditional students, urban students often have returned to school after working (which might mean a longer period of time has passed since their last formal educational experience); they are more ethnically and culturally diverse; and more women are among their ranks.

The end goal of urban students' education is not necessarily their only major life objective during their time at the university. These students are more likely to take on competing roles as employees, spouses, parents, or caregivers all at the same time. Therefore, they are also more likely to be part-time students, take longer to complete their goals, and require non-traditional class schedules (e.g., evening and weekend class times) (Elliot, 1994; Grobman, 1988).

Because of these competing goals, urban students are more likely to be place-bound than their traditional counterparts. In other words, they are less able or willing to relocate to pursue higher education beyond the distance of daily commuting (Barnett & Phares, 1995).

The accessibility of higher education in the U.S. is a pressing concern in light of shifting economic and demographic circumstances. and more specifically because of the proximity constraints of urban students. Urban universities are well positioned to respond to these concerns. Urban universities are defined by much more than their location in an urban setting; they are committed to responding to the educational needs of their surrounding regions. They share one common purpose that distinguishes them from other traditional institutions of higher education: providing the metropolitan region with access to higher education is at the forefront of the urban university mission (Klotsche, 1966; Hackney, 1994; Adamany, 1994; Lynton, 1995). They have a particular responsibility to make education accessible to the diverse and often economically disadvantaged students who reside in surrounding areas (Grobman, 1988).

The issue of the accessibility of higher education consists of several interdependent dimensions including cultural, economic, and spatial factors (Barnett & Phares, 1995; Jones & Kauffman, 1994; Kinnick & Ricks, 1990). These factors depend on characteristics of both the schools and the students (Jones & Kauffman, 1994). Universities may be welcoming or alienating to students depending on the ethnic composition of the campus and the services provided to students with special or non-traditional needs. Much of the research on the cultural component of accessibility, often addressed as diversity issues, describes specific techniques and programs to assess and promote diversity at specific schools, often from the perspective of student service providers (e.g., Hoover, 1997; Coles, 1995; Smith, Wolf, & Levitan, 1994). University policies concerning tuition, fees, and financial aid and an individual's economic circumstances can also promote or hinder access to higher education.

Few researchers have studied the spatial dimension of access to higher education and geographers have conducted most of the studies in this area. Early work on spatial variability in relation to college enrollment was based on the Spatial Interactance Model, also known as the Gravity-Potential Model (Kariel, 1968; McConnell, 1965). This model applies the laws of Newtonian physics to the spatial aspects of human behavior. A population is analogous to a mass at a point in space. Interaction between two populations is directly related to their sizes and inversely related to the distance between them. Applied to college enrollment, this model views potential college students as migrants distributed through space and attracted to educational opportunities located at other points in space. The model predicts that the greater the distance, time, and cost of engaging in an activity, the less likely an individual will do so. In terms of higher education, an individual is more likely to travel to a nearby college than one that is far away (Kariel, 1968).

McConnell (1965) applied the Spatial Interactance Model to Bowling Green State University and potential enrollees residing in the state of Ohio. Overall, he found that enrollment at Bowling Green State University was directly related to the distance of counties from the campus. Mapping the standardized residuals of the regression demonstrated that enrollment at Bowling Green was overpredicted for counties located nearer to other large universities, and conversely, enrollment at Bowling Green was underpredicted for counties nearer to Bowling Green than to other universities. In addition, those counties with the largest populations and the highest per capita income were areas of underestimation. Kariel (1968) replicated these findings in an investigation of freshman enrollment at Western Washington State College.

In contrast, Anderson, Bowman, and Tinto (1972) argued that geographic proximity of students' homes to college campuses is a minor factor in student access to higher education. These researchers did not dispute the relationship between distance and enrollment rates, but rather asserted that the importance of proximity pales when compared to other factors such as socio-economic status and academic preparedness, tuition costs and admission requirements. Anderson, Bowman, and Tinto qualified their stance by stating that their conclusions do not necessarily apply to metropolitan centers and college attendance by adults (as opposed to traditionally college-age students).

Lowe and Viterito (1989) suggested that the geographical impact of colleges and universities is hierarchical. Schools attract students from local, regional, or national bases depending on their selectiveness and academic reputation. For prospective students who seek admittance at the most competitive schools, geographical constraints are minimal. For students with less leverage in the admission process, proximity plays a more prominent role.

Much of the research on the spatial accessibility of education has been motivated by concern for finding optimal locations for building schools, primarily elementary and secondary schools (Bondi & Matthews, 1988; Dost, 1968; Maxfield, 1972; Bondi, 1987; Honey & Sorenson, 1984). Roggeveen and Thompson (1968) studied the interrelations of college locations and student commuting in San Francisco. They found that despite promises to incorporate Bay Area Rapid Transit (BART) into student transportation options, college officials located new campuses at considerable distance from rapid transit stations.

Other researchers have examined spatial access to higher education in relation to racial and financial inequity. Jones and Kauffman (1994) studied the nature of spatial access to comprehensive state universities in Texas and produced four main findings.

1. Confirming the Spatial Interactance Model, the average mileage students from counties in the border region traveled to the nearest school was five times greater than that of students from counties in any other region.
2. School and student characteristics reinforced each other. In Texas the counties with the highest income levels per capita and the most vehicles per residents were also the counties with the lowest tuition and fee levels and shortest distances to travel to the higher education institutions.

3. Low attendance in a county was associated with length of distance to the nearest comprehensive university, presence of another higher education institution (i.e., a private school or junior college) in or near the same county, and the poverty level in the county.
4. When the comprehensive university is nearby, Hispanic and white students attend at similar rates. In fact, Hispanic students attend at higher rates, but as distance from the university increases Hispanic attendance decreases more rapidly than white attendance.

Jones and Kauffman (1994) demonstrated the effect of geography in interaction with economic and cultural factors on access to higher education. They concluded that Texas demonstrated considerable inequality in access to higher education.

Following this line of research, De Oliver (1998) conducted a case study of the political issues involved in determining the site for the University of Texas—San Antonio (UTSA) and analyzed the race and class disparities in present-day costs to students as a result of the chosen site. The development of UTSA was proposed in 1969 with the purpose of providing educational opportunities to an economically underdeveloped area. The best sites for serving the stated purpose (especially the needs of the inner city poor and predominantly Latino areas) were near the core of the city¹, yet the chosen site was located on the distant periphery of the city, 15 miles from the core. The geography neither symbolized nor facilitated the objective of providing access to the poor and Latino populations.

De Oliver (1998) compared UTSA to University of Texas—Austin (UTA), which is a centrally located campus. Although the campuses differ in mission, historical development, and overall demography, he contrasted the two schools to illuminate the effect of different spatial locations on race and class. De Oliver's comparisons resulted in four main findings:

1. Maps of the predominantly Anglo and non-Anglo census tracts in each of the cities showed that both universities are located in primarily Anglo areas, however, UTA is much closer to the non-Anglo tracts than is UTSA. The same pattern held true for maps of the economic class of census tracts; UTA is much closer to upper class tracts than is UTSA.
2. Students from Latino census tracts travel 11.4 miles farther on a daily average than do students from Anglo tracts. In terms of average fuel costs, students from Latino tracts pay \$116 more per year than students from predominantly white tracts. Students from low or middle class census tracts travel 16.5 miles farther on a daily average than do students from upper class tracts. In essence, this amounts to imposing an annual travel fee of approximately \$168 on students from low and middle-class areas, not including an estimate of the value of their travel time. Furthermore, these estimates are conservative because they are based on straight-line distances.
3. Public transportation is a less effective means of travel to the university in UTSA than UTA. In Austin, many bus lines run through the core of the city and therefore to the UTA campus. In contrast, only four bus lines run through the UTA campus. Three of these terminate in the nearby upper class and Anglo areas. Only one bus line in San Antonio leads from the university to the urban core. This bus is an express line, so it costs \$0.75 instead of \$0.35 per ride. In other words, the poorer and predominantly Latino students pay a 50% increase over local neighborhood students to use public transportation to travel to school. Adding insult to injury, the express line is unavailable on weekends.
4. The isolated campus of UTSA does not allow for competitive pricing of food and supplies. Whereas UTA is within walking distance of a variety of restaurant franchises and retail stores, only a few stores and restaurants are located near UTSA and none are within walking distance. UTSA students paid on average increase of 3% at on-campus compared to off-campus franchises. Food items that were especially popular with students were priced disproportionately higher. At UTA, students paid an average decrease of 8% at on-campus compared to off-campus franchises. A similar pattern emerged for the pricing of student supplies. At both UTA and UTSA, items in the campus

bookstore were priced higher than in a large mass-market retail store, however, the difference in pricing is much greater at UTSA than UTA. UTSA student pay a 20% average increase over what UTA students pay.

The present study is based on the Spatial Interactance Model and attempts to confirm and extend previous research. Whereas most of the previous research focused on access to higher education at the county and state level, the present study focuses on access in one metropolitan region. Secondly, Jones and Kauffman (1994) and De Oliver (1998) demonstrated the impact of culture and poverty level on access to higher education by comparing Latino and Anglo populations. The present study compares the impact of distance and income level on Asian, African American, Hispanic, Native American, and Caucasian populations. In keeping with previous findings, I hypothesized that participation rates would decrease as the distance of students' homes from the university increases. Income level and ethnicity would interact with distance. In comparison to Caucasian students and higher income students, participation rates for minority students and lower income students would decline more sharply with distance from the university.

METHOD

Sample and Data Sources

The sample consisted of 16,067 students whose zip codes and ethnic information were extracted from the PSU Student Information System. These were students enrolled at Portland State University (PSU) at the fourth week of Fall Term 1991. Of these, 1,475 had zip codes which were outside of the six-county Portland metropolitan region or unusable (i.e., the zip code was partially or fully missing), resulting in 14,592 usable records.

Counts of students by zip code and ethnicity were calculated from the extracted student records. Students resided in 108 zip code areas around Portland State University and ranged in number from 1 to 1,698 per zip code area. The student zip codes were linked to population data (by zip code areas) from the 1990 U.S. Census.

Data Elements and Research Design

The PSU enrollment rate for each zip code area was the dependent variable that served as the measure of access to higher education. Enrollment rate for each zip code area was the percentage of students who attended PSU out of the number of college age persons (between 17 and 44 years of age²) in the zip code area. Enrollment rates were also calculated by ethnicity. For example, the Hispanic enrollment rate for each zip code was the percentage of Hispanic students who attended PSU out of the number of Hispanic college age persons in the zip code area. Therefore, in addition to the overall enrollment rate, an enrollment rate for each ethnic group was calculated in each zip code area.

Distance and income level were the two independent variables of interest. Distance between the centroid of each zip code and PSU was calculated as a straight line. Per capita income for each zip code, in aggregate and by ethnic group, served as measures of income level.

Limitations of the Data Sources and Design

One assumption of the chosen method was that the student zip codes extracted from the Student Information System accurately reflected the location of students' residences. The address information that students gave to the University did not necessarily reflect the location of student residences. The addresses could have been mailing addresses or permanent addresses (such as their parents' addresses). Also, students move frequently, and do not necessarily update their school records promptly, resulting in quickly obsolete address information. I found evidence of these problems when linking the student zip codes to census data; some of the zip codes were outside the six-county metropolitan area, in fact, some were out-of-state zip codes and postal codes from foreign countries. A related concern was how to treat zip codes for post office boxes. Because census data was unavailable in these instances, I excluded these students from the analysis.

Results & Discussion

Table 1 shows the descriptive statistics for the enrollment rates, distance, and income level. The highest overall enrollment rate for a zip code was 14%. The range of enrollment rates by ethnicity ranged widely because of small minority counts in some zip codes. The Asian population had the highest average enrollment rate (5.51%) across zip codes. The Hispanic population had the lowest enrollment rate (1.11%). Per capita income across zip codes was highest for Caucasians and lowest for African Americans. Distance of zip code areas from PSU ranged from less than a mile to almost 50 miles.

Table 1

Distance from PSU, Income Level, and Enrollment Rates of Zip Code Areas

Characteristic	<u>N</u>	Min	Max	<u>M</u>	<u>SD</u>
Students in Zip Code					
All	108	1.00	1,698.00	135.11	214.23
Asian	96	-	358.00	15.24	40.01
African American	77	-	64.00	4.36	9.66
Hispanic	105	-	34.00	2.77	4.77
Native American	103	-	18.00	1.20	2.39
Caucasian	108	-	1,002.00	97.15	140.07
College-age Persons in Zip Code					
All	108	105.00	23,556.00	6,436.82	5,425.94
Asian	108	-	1,677.00	245.94	350.15
African American	108	-	4,858.00	169.33	554.17
Hispanic	108	-	1,914.00	243.70	285.35
Native American	108	-	322.00	71.27	71.34
Caucasian	108	105.00	20,930.00	5,845.91	4,876.99
Enrollment Rate (%)					
All	108	0.07	14.00	2.10	1.73
Asian	96	-	33.06	5.51	5.66
African American	77	-	40.00	1.84	6.57
Hispanic	105	-	19.05	1.11	2.39
Native American	103	-	40.00	1.64	6.12
Caucasian	108	-	9.41	1.66	1.29
Distance from PSU					
Feet	108	3,232.61	261,379.40	92,811.82	63,841.85
Miles	108	0.61	49.50	17.58	12.09
Per Capita Income (\$)					
All	108	7,221.00	29,742.00	14,354.69	4,031.93
Asian	96	34.00	32,279.00	9,413.36	5,632.00
African American	77	-	44,000.00	8,231.43	6,955.52
Hispanic	105	2,766.00	38,110.00	9,122.04	4,955.93
Native American	103	1,053.00	75,763.00	10,793.53	8,222.61
Caucasian	108	7,936.00	30,247.00	14,672.88	4,056.76

The intercorrelation matrixes for distance, per capita income, and enrollment rates appear in Table 2. Distance is inversely related to enrollment rates in the aggregate and by ethnicity. Per capita income is directly related to enrollment rates with the exception of African American population.

Table 2

Intercorrelations Between Distance, Income Level, and Enrollment Rate

Ethnicity	Variables	Correlations		
		1.	2.	3.
All				
	1. Distance	--	-.43*	-.56*
	2. Per Capita Income		--	.62*
	3. Enrollment Rate			--
Asian				
	1. Distance	--	-.32*	-.46*
	2. Per Capita Income		--	.08
	3. Enrollment Rate			--
African American				
	1. Distance	--	-.23*	-.13
	2. Per Capita Income		--	-.09
	3. Enrollment Rate			--
Hispanic				
	1. Distance	--	-.07	-.38*
	2. Per Capita Income		--	.17*
	3. Enrollment Rate			--
Native American				
	1. Distance	--	-.04	-.26*
	2. Per Capita Income		--	.28*
	3. Enrollment Rate			--
Caucasian				
	1. Distance	--	-.48*	-.58*
	2. Per Capita Income		--	.66*
	3. Enrollment Rate			--

*p < .05

I conducted Multiple Regression to analyze the data, using distance and per capita income to predict enrollment rates for the total sample and for each ethnic group. The regression coefficients were significant for the total group and for each ethnic group except African Americans. (See Table 3.) Overall, distance and income level accounted for 48% of the variance in enrollment rates, however, these variables accounted for only 1% to 20% of variance in enrollment rates by ethnic minorities. Distance and income level accounted for the most variance in enrollment rates of the Caucasian population (52%).

Table 3

Summary of Regression Analysis for Variables Predicting Zip Code Area Enrollment Rates

Variable	<u>N</u>	<u>R</u>	<u>Adj R²</u>	<u>B</u>	<u>Beta</u>
All	108	.70*	.48		
Distance from PSU				-.0509*	-0.36
Income Level				.0002*	0.47
Asian	96	.47*	.20		
Distance from PSU				-.2370*	-0.49
Income Level				-.0001	-0.07
African American	77	.18	.01		
Distance from PSU				-.0990	-0.16
Income Level				-.0001	-0.13
Hispanic	105	.41*	.15		
Distance from PSU				-.0734*	-0.37
Income Level				.0001	0.14
Native American	103	.38*	.12		
Distance from PSU				-.1290*	-0.25
Income Level				.0002*	0.27
Caucasian	108	.73*	.52		
Distance from PSU				-.0355*	-0.33
Income Level				.0002*	0.51

Note. Distance measured in miles. SE of Beta < .001 for all regression equations.

*p < .05

As expected, enrollment rates generally declined as zip code areas increased in distance from PSU. In addition, enrollment rates declined more sharply with distance as income levels decreased. The effects of distance and income on enrollment rates differed by ethnicity. The data indicated that distance from PSU and income level are weaker predictors of enrollment for ethnic minorities than they are for Caucasians. To the limited extent that these variables predict enrollment rates, distance was the strongest predictor of enrollment for Asians.

Contrary to the stated hypothesis, income level was negatively (but not significantly) related to enrollment for Asians and African Americans. Although the design of the present study precludes an explanation for this finding, one could speculate that a cultural emphasis on the importance of obtaining higher education and availing one's self of scholarship and grant opportunities offsets the effects of limited income.

Distance and income do not predict enrollment for the African American population. One possible explanation might be too little variance in the data. In Portland, the African American population is generally concentrated in one area to the North of the central business district. Another explanation for this result might be simply that other factors play a role in the decision to attend college and are better predictors of enrollment for this group.

The present study confirmed previous findings about the relationship between distance, income, and enrollment rates. In addition, it elaborated on previous research (i.e., Jones & Kauffman, 1994) and demonstrated the differential effects of distance and income on enrollments by ethnic group. Although the results generally confirmed the stated hypotheses about enrollment rates, the findings inevitably led to more questions than answers. In particular, the results indicated that factors other than distance and income level are more predictive of enrollment rates for ethnic minorities. What are these factors and why do they differ by ethnicity? Secondly, what explains the inverse relationship between income and enrollment rates exhibited by some of the ethnic groups?

The limits of the methodology lead to suggestions for future refinements to research on this topic. The limitations of the data sources and design appear in the Method Section. The main concern was the accuracy of the student address information. Validity checks on the address data, for example, telephoning students to verify the location of their residence, were beyond the scope and resources of the present study, but would improve this research.

With more accurate address information, a smaller unit of analysis such as census tract, and more precise measures of distance based on street address (instead of zip code centroid), could be incorporated into the research design. Other refinements to the present study would be to calculate transit route distance instead of straight-line distance and add primary transportation mode to the research variables. More information on means of transportation and routes would build on De Oliver's (1998) finding of transportation inequities between Latino and Anglo populations in San Antonio. In addition, factoring in the presence of other local institutions of higher education would help to account for more of the variance in enrollment rates.

The present study used the enrollment rate of current students as an indicator of access to higher education. Obtaining address information and calculating the distance of applicants from the university would broaden this definition of accessibility. Moreover, a longitudinal design would provide a more complete picture of access to higher education. In this case, university applicants would be the unit of analysis (instead of zip code areas). Applicants would be tracked to see whether distance from the university influences their decision to enroll. For those who do enroll, the next step would be to investigate whether distance from the university (and changes in distance) affect student performance and outcomes.

Past research on the relationship of proximity, income, ethnicity and enrollment rates emphasized locating optimal and equitable sites for new campuses (Bondi & Matthews, 1988; De Oliver, 1998; Dost, 1968; Jones & Kauffman, 1994; Maxfield, 1972; Bondi, 1987; Honey & Sorenson, 1984; Roggeveen & Thompson, 1968). Establishing new campuses is perhaps a lower priority today than in the past, but research on spatial access continues to be relevant to the higher education arena because of the growing interest in the capabilities of distance education technology. To the extent that college officials, policymakers, and the metropolitan community understand the interaction of proximity, income, and ethnicity, the better informed their decisions about how best to use distance education delivery.

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ENDNOTES

1. The decision to locate the university on the periphery could not be justified by cost and community disruption concerns alone. At least one site near the core of the city met such criteria. Its advantages included traffic accessibility, existing buildings, and attractive landscaping. In addition, choosing this site would not reduce county revenue because the property was already off the county tax roles.
2. More than 95% of students enrolled at PSU during Fall Term 1990 were within this age range. (Fall Term Fact Book, 1990).

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